

Agenda

September 11, 2017

NWIRP/Northrop Grumman Groundwater Quarterly Coordination Meeting

1. Introductions

2. U.S. Navy Update

- a. Additional contaminant/plume delineation
- b. Sentinel/Outpost monitoring well program results
- c. GM-38 update
- d. Status of RE-108 Area & Interim Hot Spot Conveyance System (Phase I RE-108)
 - 1) RE-108 / Phase 1 RE-108 schedule
 - 2) Recovery Well (RE-137) pumping test update
 - 3) Property acquisition for RE-108 treatment system (wells, conveyance, treatment, and discharge)
 - 4) Possible use of BWD Plant 6 & comparison to RE-108 scenarios
 - I. Pumping wells
 - II. Treatment system
 - III. Property
 - 5) Possible Re-Use of Treated Water from BWD Plant 6 for Public Water Supply
 - 6) Update Phase I RE-108 design
- e. Update on Navy reporting to Congress per the Water Infrastructure and Investment Act
- f. Community Outreach Activities
 - 1) April 5, 2017 RAB Meeting

3. Northrop Grumman Update

- a. Status of ONCT and BPCP Groundwater Containment Systems
- b. Hydraulic Effectiveness Evaluation
- c. Status of RW-21 Area
 - 1) RW-20 installation
 - 2) Conveyance piping, treatment system, and discharge status
 - 3) Schedule
- d. Community Outreach Activities
 - 1) NG/NYSDEC development of community outreach materials, as needed, for future NG work

4. U.S. Navy and Northrop Grumman Coordination

- a. Recent activities related to project coordination
- b. Coordination on RE-108 hot spot work – Possible RE-108 modeling assistance

5. Bethpage Water District Plant 6 Update

- a. Plant 6 upgrade project

6. NYSDEC Update on Status of efforts regarding Chapter 543 of the Laws of 2014

- a. Evaluation of options relative to the groundwater plume associated with the former Navy/Grumman Bethpage facility – and next steps following the HDR report
- b. Three major components:
 - 1) VPB drilling/Monitoring Well Installation
 - 2) Groundwater Flow Modeling
 - 3) Feasibility Study
- c. October 2017 Outreach

7. NYSDEC Report on Radiological Investigations

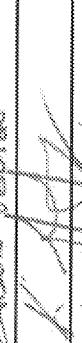
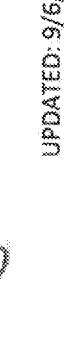
8. Follow-Up Items From Previous Meetings:

- a. Navy to provide an analysis of cost and time to implement differences associated with treating groundwater at BWD Plant 6 versus treating groundwater at the GM-38 treatment plant
- b. Include the influence of BWD Well 6-2 into the Northrop Grumman presentation of the groundwater trend data.

9. Next Quarterly Meeting Date, Location, and Adjournment

- a. Bring calendars to select dates for next quarterly meeting

NWIRP / Northrop Grumman Groundwater Quarterly Coordination Meeting
 2nd Quarter 2017
 Northrop Grumman Offices, NY

	Name	Organization	Email Address	Phone Number	Sign-In
1	Michael Bouffis	Bethpage Water District, Superintendent	mboufis@bethpagewater.com	(516)931-0093	
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NWIRP / Northrop Grumman Groundwater Quarterly Coordination Meeting

2nd Quarter 2017

Northrop Grumman Offices, NY

	Name	Organization	Email Address	Phone Number	Sign-In
21	Ralph Atoria	South Farmingdale WD, Commissioner	ratoria@sfwater.com	(516) 250-3089	<i>Ralph A. Atoria</i>
22	Frank Koch	South Farmingdale WD, Superintendent	koch@sfwater.com	(516) 249-3330	<i>Frank J. Koch</i>
23	Gary Loesch	South Farmingdale WD (H2M, representing SFWD)	loesch@h2m.com	(631) 756-8000	<i>Gary Loesch</i>
24	John Reinhart	Town of Hempstead Department of Water	johnr@towmail.org	516-744-3300	<i>John Reinhart</i>
25	Salvatore Badalamenti	U.S. EPA	Badalamenti.Salvatore@epa.gov		
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27	Maureen Hickey	U.S. EPA	Hickey.Maureen@epa.gov		
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35	Tanya Connors	<i>Tanya Connors</i>			
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38	Sgt. J. Garcia	DeLoach N.D.	CAPT200NY2002@YAHOO.COM	516-931-5661	<i>Sgt. J. Garcia</i>
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40					
41					
42					
43					



**NAVY UPDATE
QUARTERLY PROGRESS MEETING
SEPTEMBER 11, 2017**

**NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK**

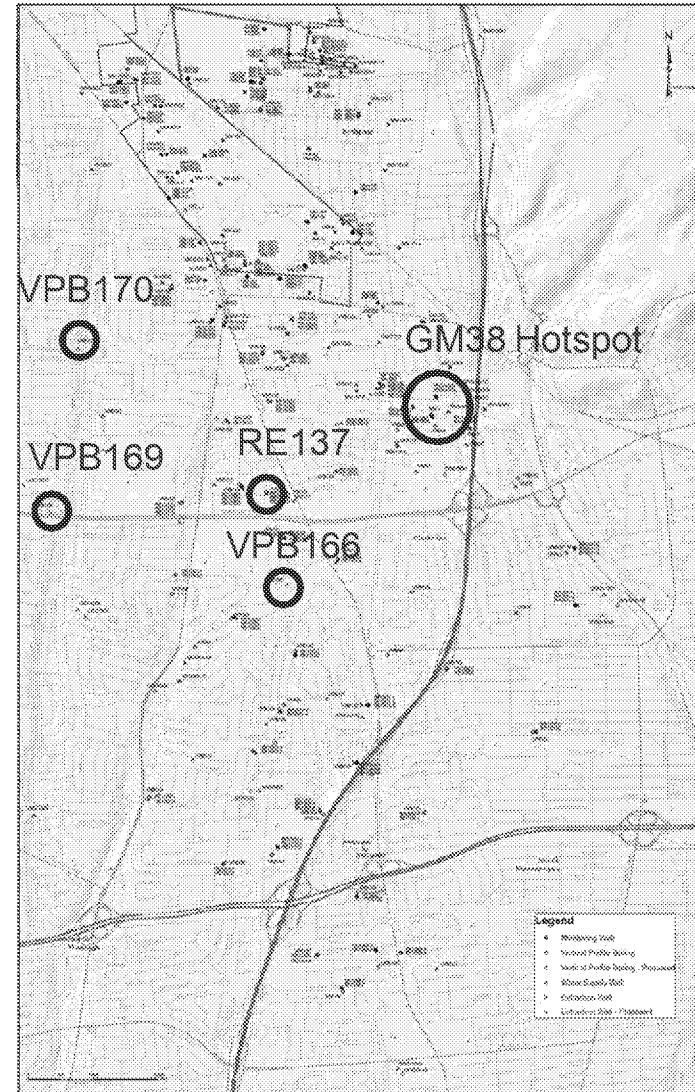
AGENDA

- Navy Drilling/Monitoring Program Overview – Current Status
- GM38 Area Hotspot Treatment System
- RE108 Area Hotspot Treatment System, Phase I and II

NAVY PROGRESS OVERVIEW – CURRENT STATUS

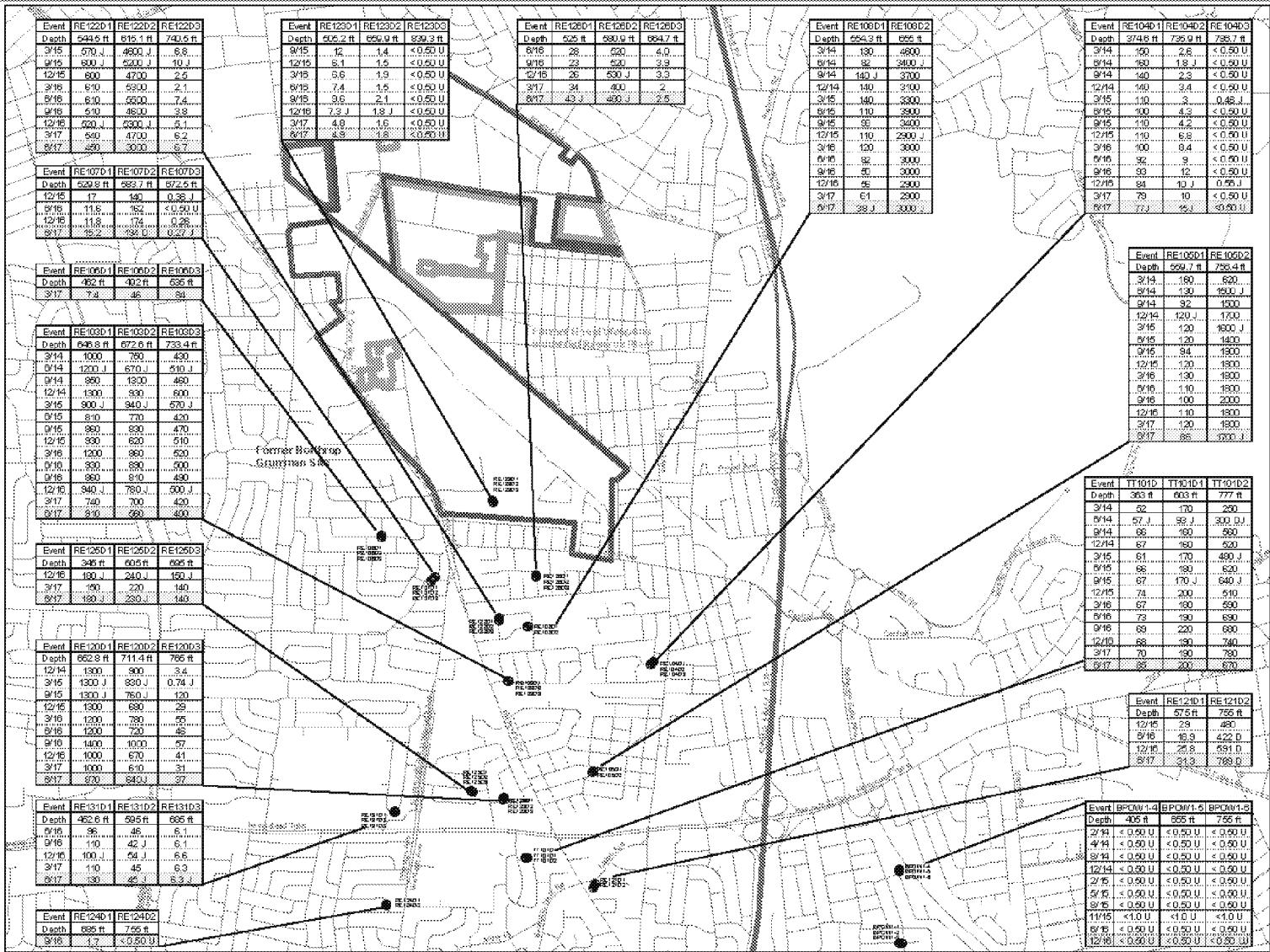
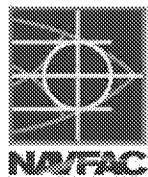


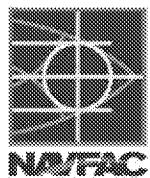
- Drilling program – Ongoing
 - Currently at VPB166 Location
 - VPB169, 170 completed
- Quarterly groundwater monitoring
 - RE108 and Outpost Wells
- Operation and monitoring of the GM38 Hotspot Treatment System
 - 1,000 gallons per minute (gpm) system, currently evaluating potential for shutdown in near future
- Pre-Design activities for the RE108 Hotspot Treatment System
 - RE 137 pumping test evaluation
 - Phase I Design Report – Internal review and contractor procurement underway



QUARTERLY GROUNDWATER SAMPLING

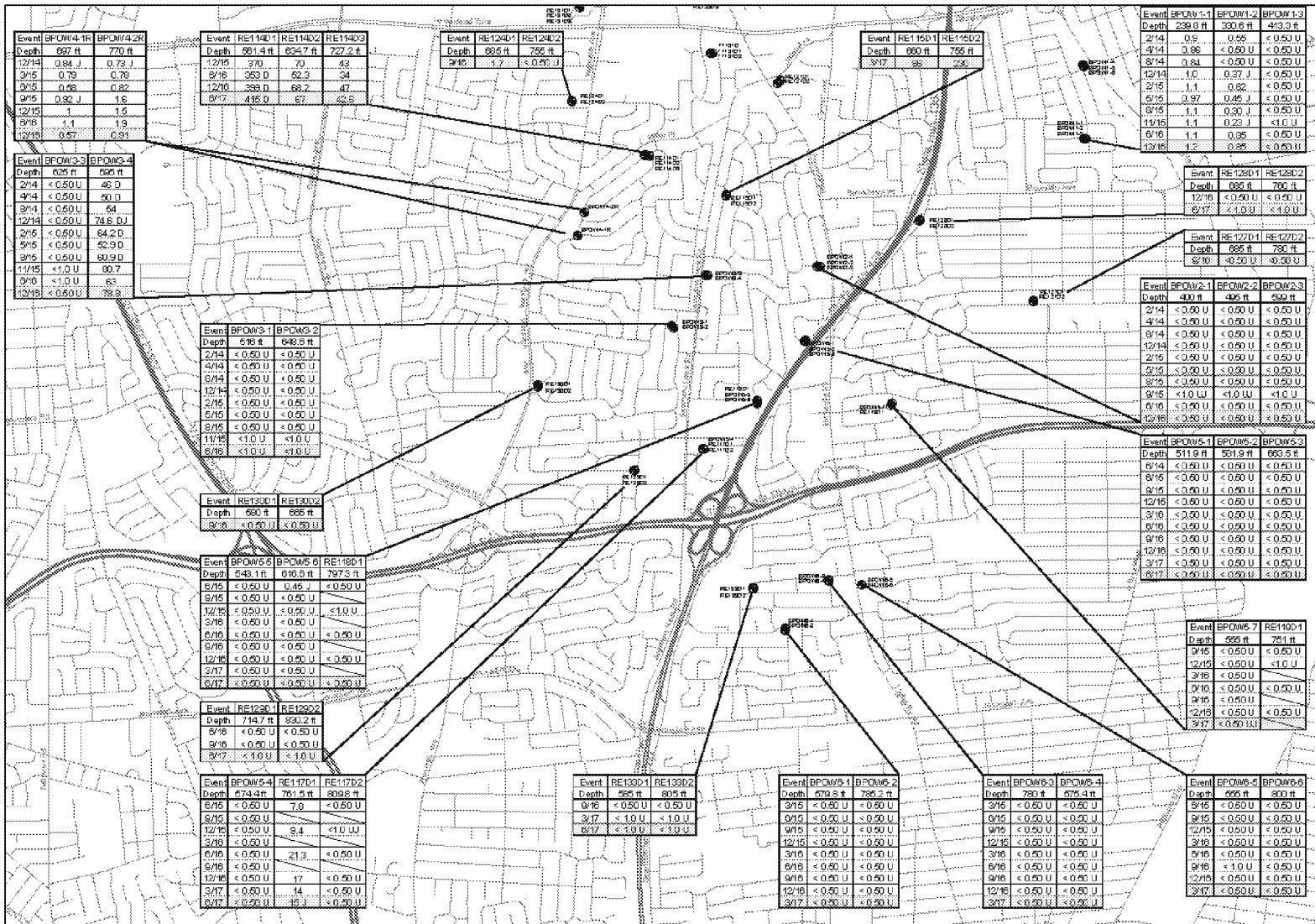
NORTHERN WELLS - TCE





QUARTERLY GROUNDWATER SAMPLING

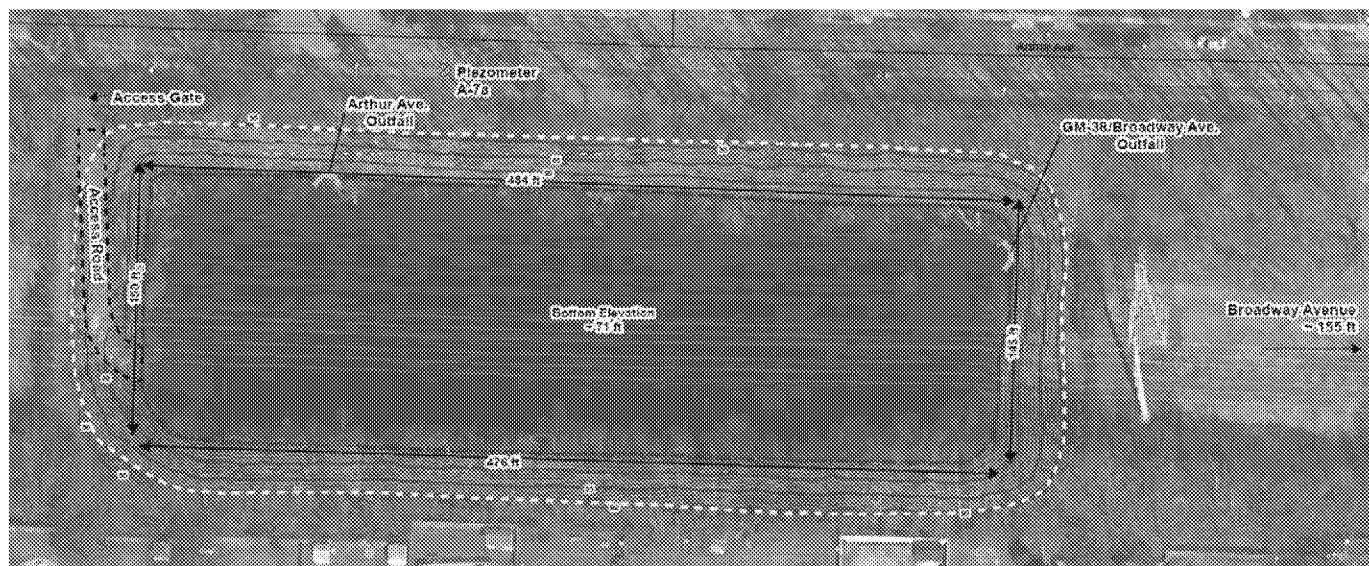
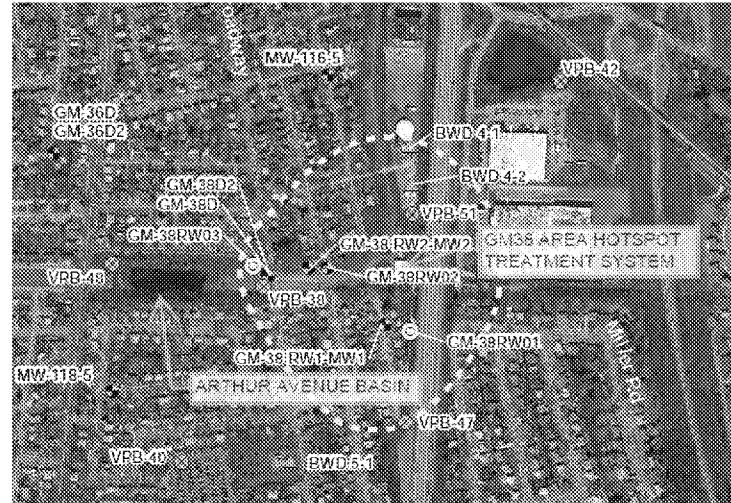
SOUTHERN WELLS – TCE



GM38 AREA HOTSPOT TREATMENT SYSTEM



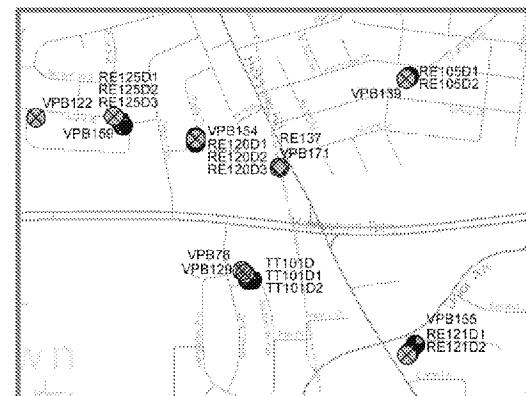
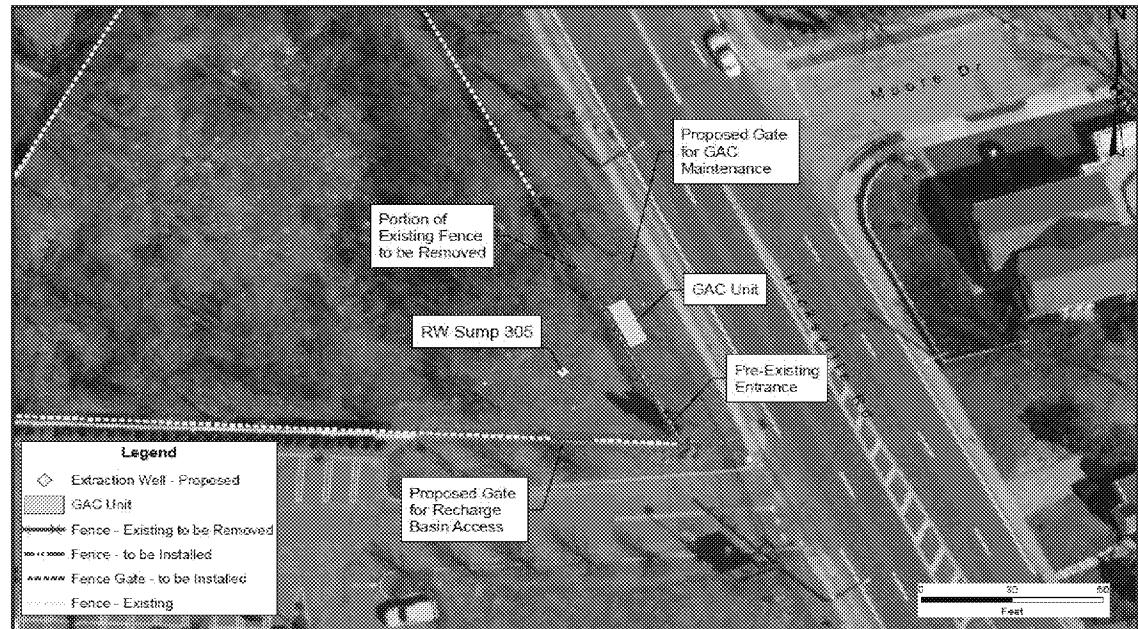
- VOC concentrations continuing to decrease, TCE currently at 100 micrograms per liter
- Removal of accumulated sediment in basin #495
 - Work plan submitted to NYSDEC, Town and Nassau County
 - Concurrence received by NYSDEC
 - Waiting for responses from Town and County



VPB 171 AND RE137 WELL PUMPING TEST



- VPB171 and a test recovery well (RE137) in Nassau County recharge basin #305, near intersection of Hicksville Road and Hempstead Turnpike
- Aquifer testing to evaluate the capture zone of the test recovery was conducted in April 2017
- Data analysis is ongoing

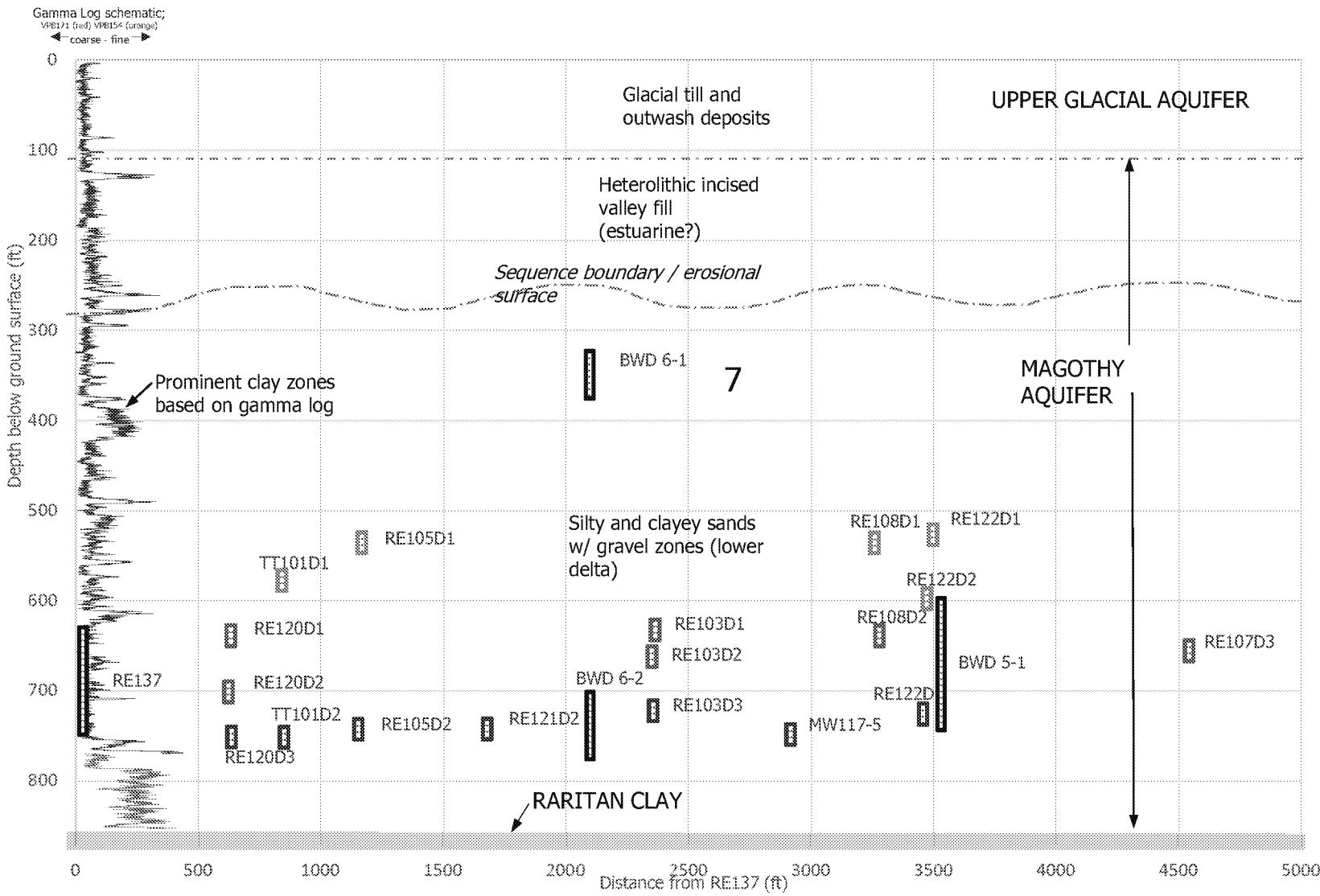
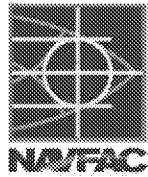


STATUS OF RECOVERY WELL RE137 TEST



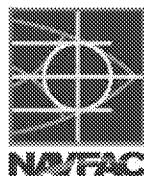
- **Recovery Well RE137 installed for aquifer testing**
 - 12-inch diameter well, 750 feet depth below ground surface (bgs)
 - 115 feet of screen (630 – 745 feet bgs)
- **Step Testing** at 100, 200, 300 gpm performed on April 10, 2017
- **Constant Rate Test** conducted at average 741 gpm for 3 days
 - Water levels in monitoring wells throughout the area were evaluated
 - Total drawdown approximately 17 feet;
 - Stabilization at approximately 100 minutes
- **Capture zone** to be estimated using aquifer parameters and analytical equations
- **Modeling** is being used to predict RE137 capture zone
- **Data analysis** expected to be completed in November

HYDROGEOLOGIC CONCEPTUAL SITE MODEL FOR RE137 AREA – SPATIAL DISTRIBUTION OF OBSERVATION WELLS

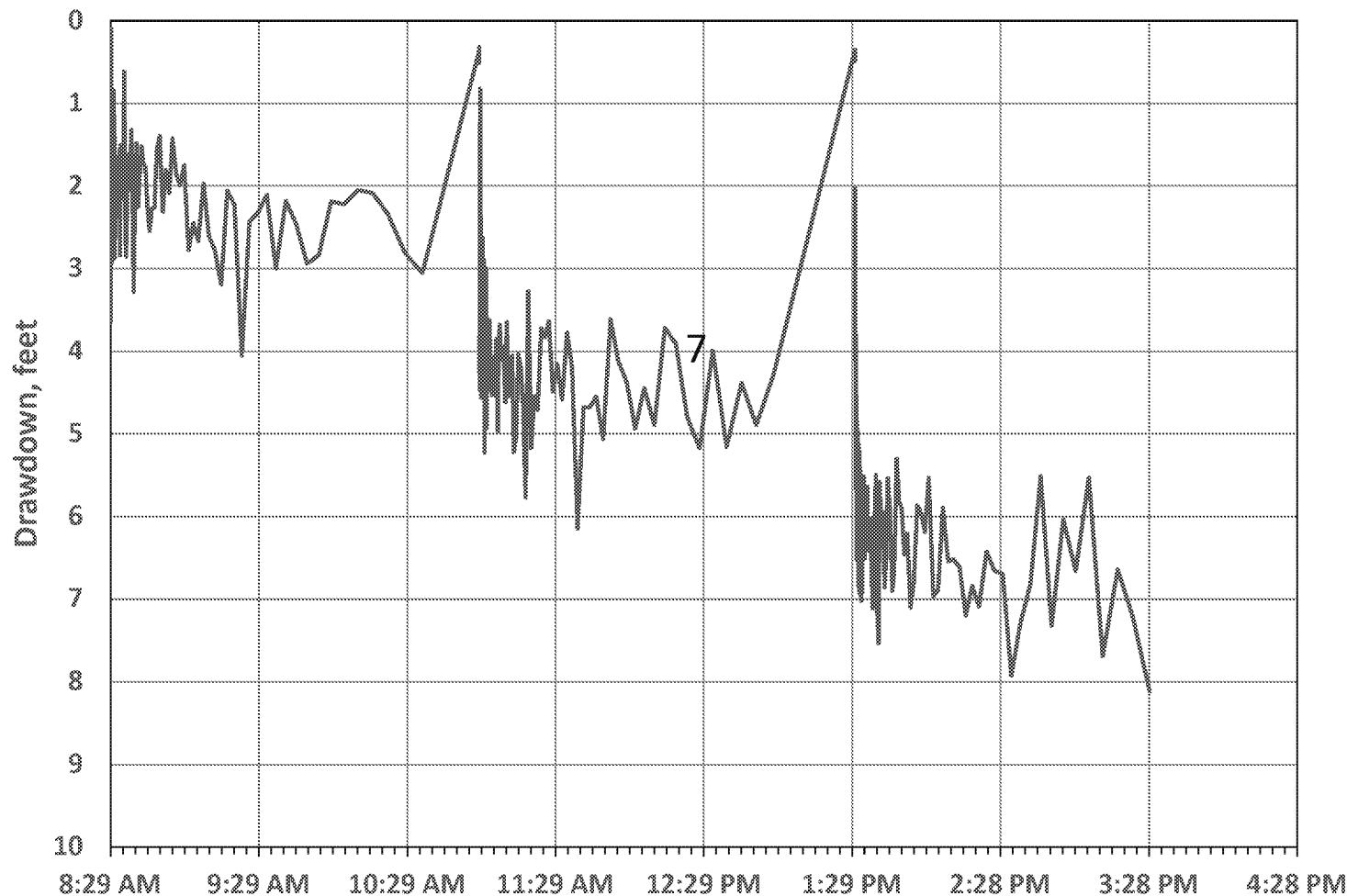


WELL RE137 WATER LEVEL DRAWDOWN

STEP PUMPING TEST, APRIL 10, 2017

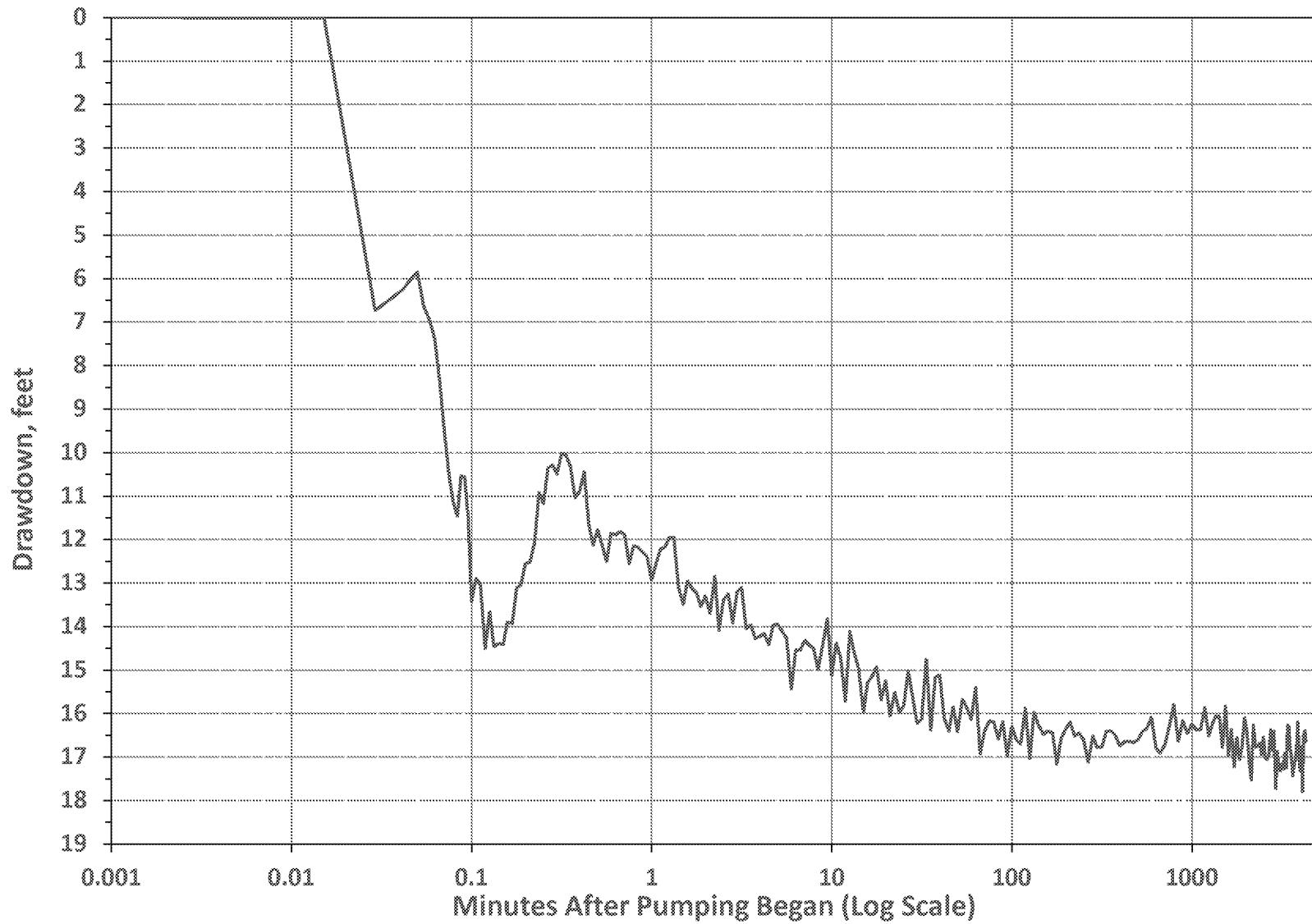


Steps 1, 2, 3 (100, 200, 300 gpm)



WELL RE137 WATER LEVEL DRAWDOWN

CONSTANT RATE PUMP TEST, APRIL 11, 2017



RE108 HOTSPOT

- Phase I System to address concentrated northern half of the plume
- Phase II System to address southern portion of the plume



PHASE I RE108 AREA HOTSPOT CONVEYANCE SYSTEM



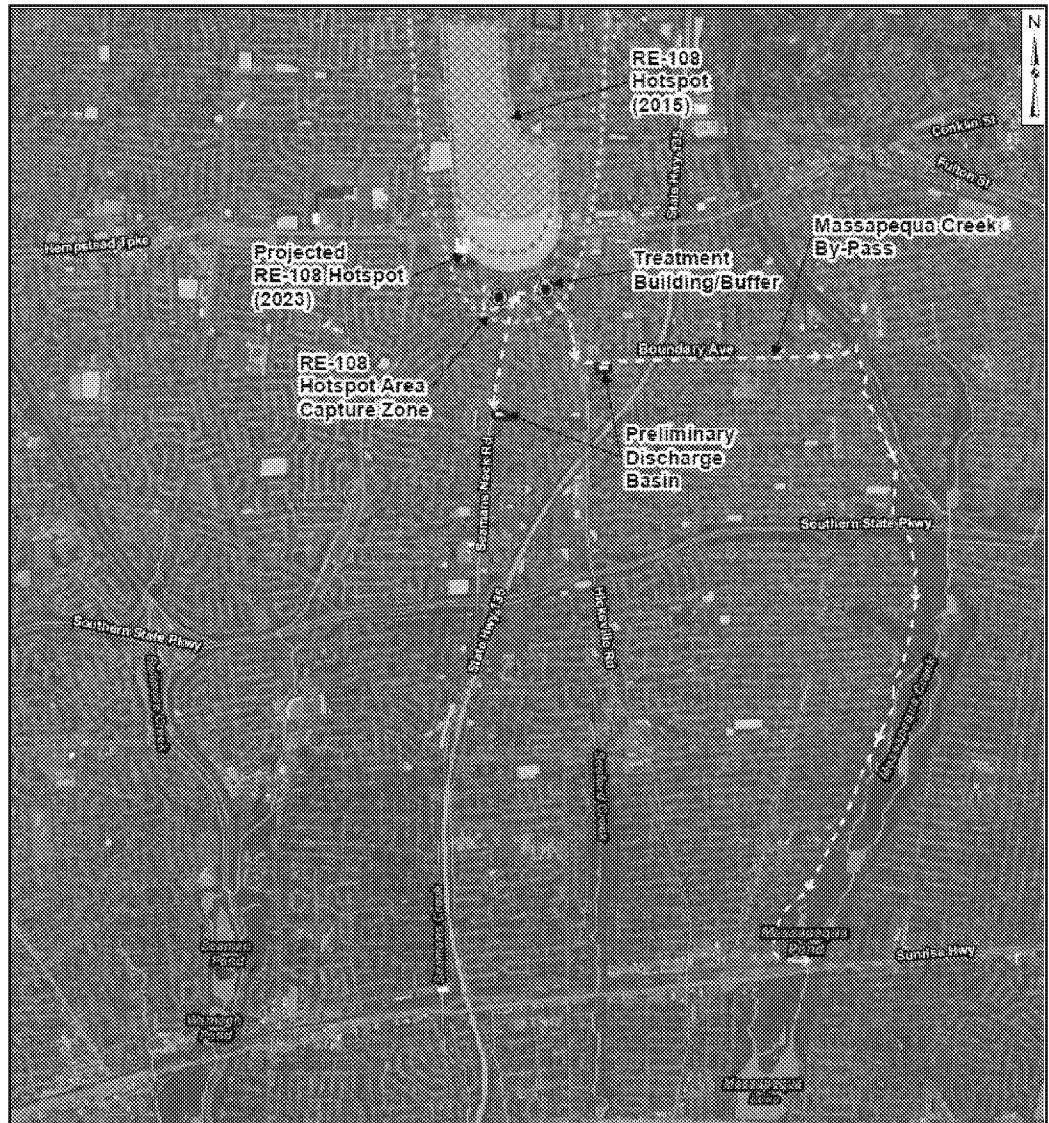
- Install a single extraction wells (550 to 650 feet bgs) in the middle of the hotspot
- Calculated groundwater extraction rate: 400 gpm, design for 300 to 500 gpm
- Run 0.7 to 0.9 mile along existing utility corridor to RW-3 (or GM38)
- Use excess capacity at GM38 Hotspot Treatment System to treat groundwater
- Based on property access requirements, design and construction could be completed in approximately 1.3 years
- Operation would reduce RE108 Hotspot migration rate



PHASE II RE108 AREA HOTSPOT



- Extraction Wells south of Hempstead Turnpike (ahead of the plume)
- To minimize risk to community, treatment system should be in proximity to extraction wells
- Treated discharge to basins or surface water
- When groundwater and drinking water standards are promulgated for 1,4-dioxane, treatment and/or discharge requirements will be addressed



RE108 HOTSPOT SYSTEM PHASE II PATH FORWARD



- Preliminary design activities underway, including pumping and basin recharge testing planned for 2017. Critical design issues are:
 - Finalize extraction rates
 - Identify discharge location(s)
- Design Report – December 2017
- Property access, treatment plant location and utility easements ongoing, 1 to 3 years estimated
- Detailed design, 1 to 1.5 years
- Construction approvals, dependent on community concerns, estimate of 0.5 year
- Construction and Startup, 1.5 years

Quarterly Groundwater Coordination Meeting

**NYSDEC / USEPA Region 2
Northrop Grumman Systems Corporation
NAVFAC**

September 11, 2017

Northrop Grumman Discussion Topics

- Status of Northrop Grumman/Navy Cooperation
- Update on Northrop Grumman OU2 Activities
 - OU2-ONCT System OM&M/Effectiveness
- Update on Northrop Grumman OU3 Activities
 - OU3-ONCT System OM&M/Effectiveness
 - Off-Site RW-21 Project Area Groundwater Investigation/Remediation
 - Hydraulic Effectiveness Study
- Radium Water Sampling

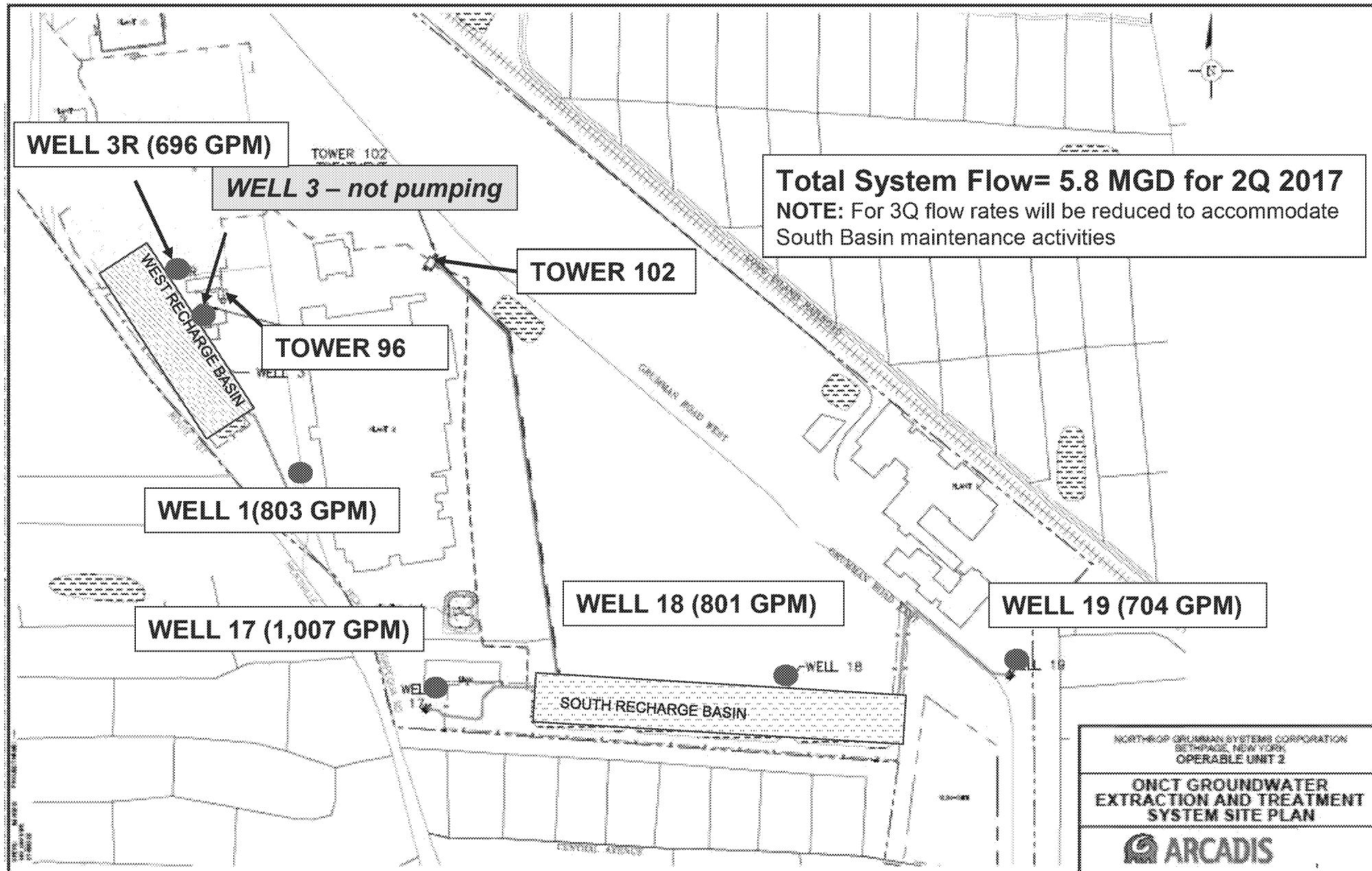
Status of Northrop Grumman/ Navy Cooperation

- Reviewing RE108 area data and communications
- Technical Exchange Meetings with Navy (last held on November 16, 2016)
- Northrop Grumman continues sampling additional wells installed by Navy (per Navy letters May 6, 2015 and April 3, 2017) and provides results to Navy for reporting – *Ongoing*
- Review of Navy data and incorporation into 2016 annual report and OU2-ONCT evaluation

OU2 ACTIVITIES

Update on Northrop Grumman OU2 Activities

- OU2-ONCT System OM&M
- OU2-ONCT System Effectiveness



OU2-ONCT System OM&M

- Uptime & Performance for 2Q 2017

- **T96 System:** >99% uptime

	<u>% Uptime</u>	<u>% Design Flow Volume</u>
• Well 1:	99.7	100
• Well 3R:	99.7	99

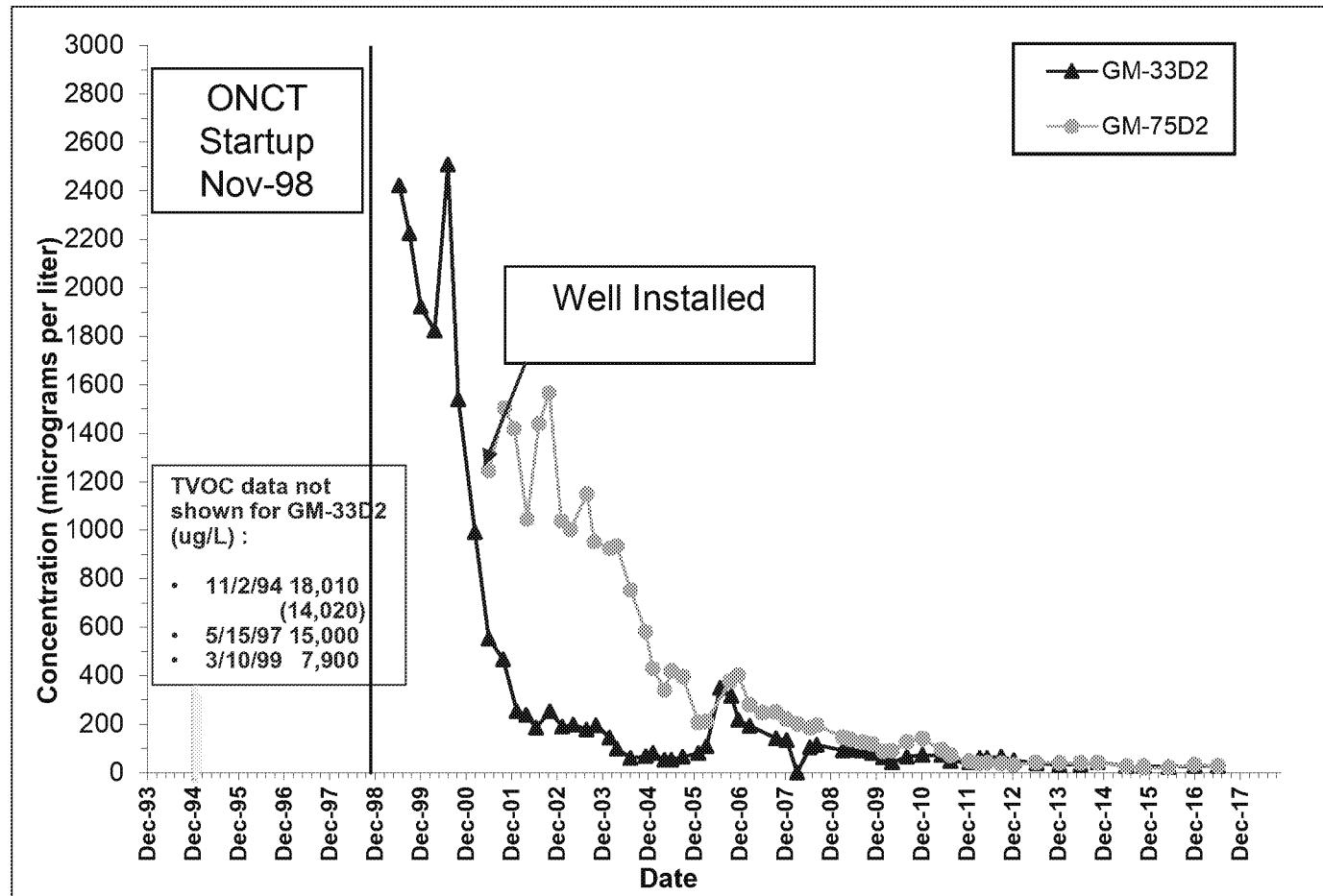
- **T102 System:** >99% uptime

	<u>% Uptime</u>	<u>% Design Flow Volume</u>
• Well 17:	99.3	100
• Well 18:	99.1	132
• Well 19:	98.6	99

OU2-ONCT System OM&M – cont'd

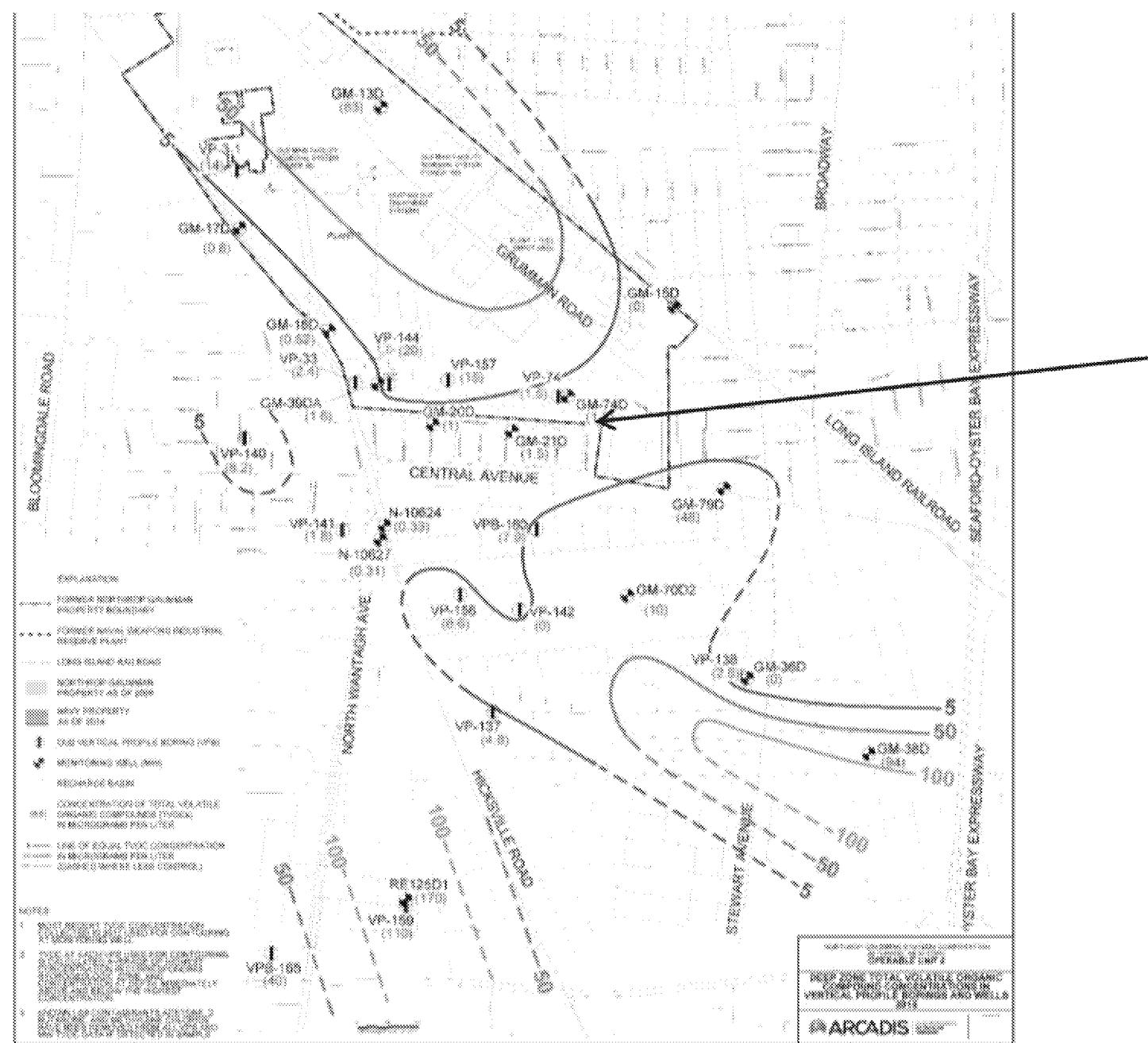
- Downtime due to routine maintenance activities
- >99.9% treatment efficiency, discharge is compliant
- Cumulative Mass Removal
 - ~ 202,000 lbs VOCs removed from start up of OU2-ONCT System in 4Q 1998 through 2Q 2017

TVOC Trends at/Downgradient of OU2 ONCT

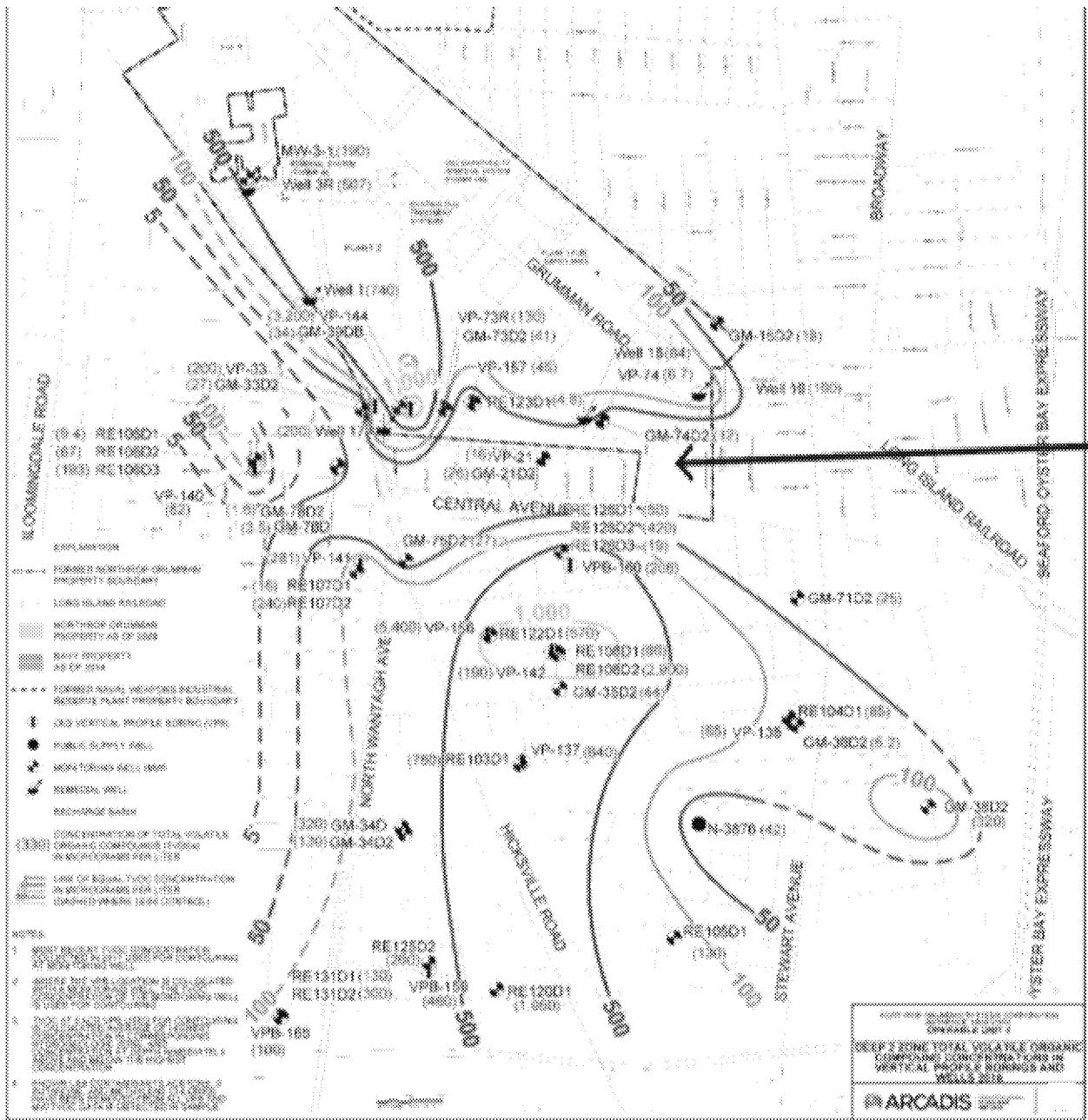


- GM-33D2
 - >99% reduction from historical maximum
- GM-75D2
 - >99% reduction from historical maximum
- Decrease in VOCs indicates ONCT effectiveness
- VOC Sources to these wells have been cut off

These improvements in groundwater quality have occurred because of hydraulic control of the on-site plume



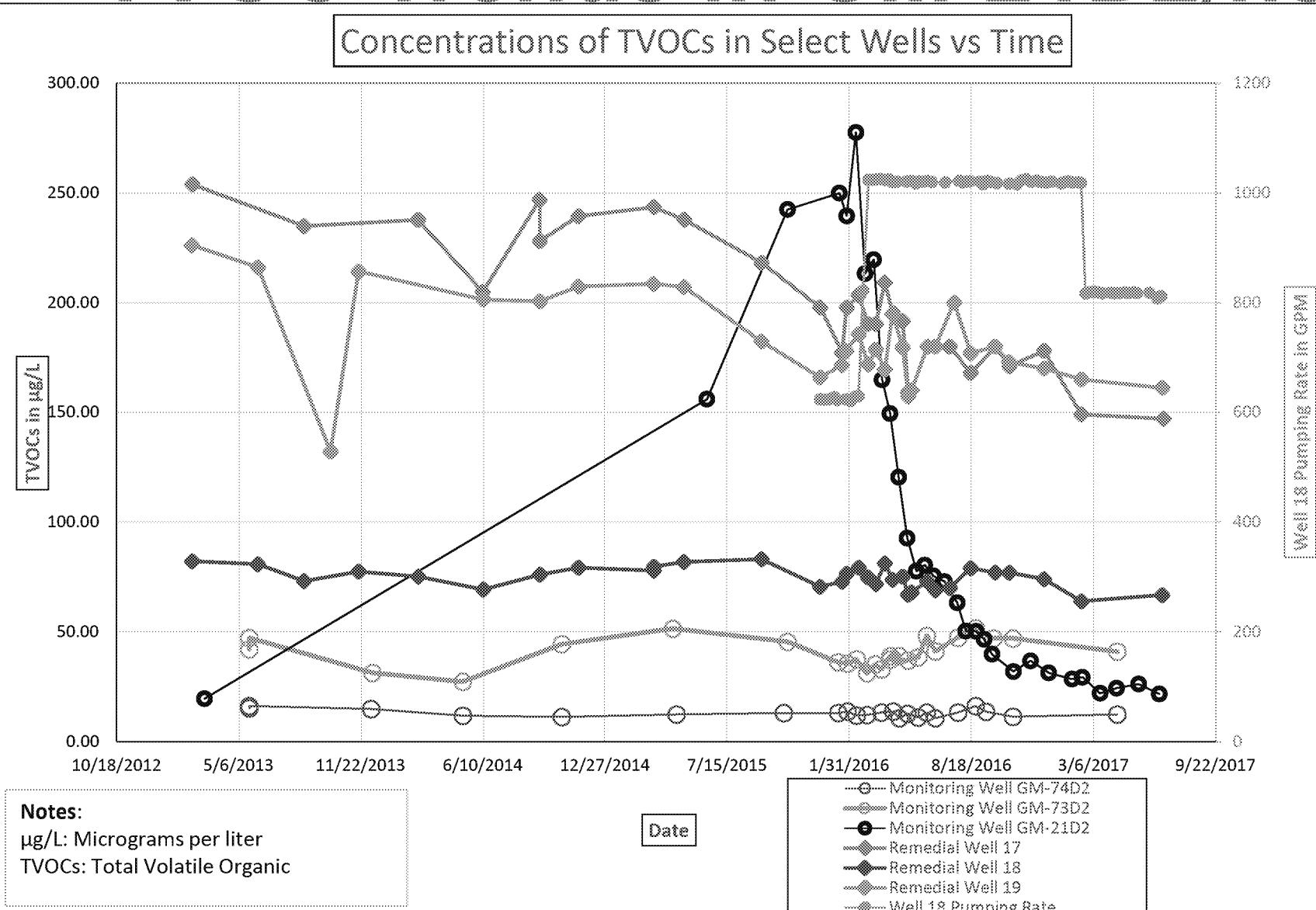
PLUME BIFURCATION IS
OCCURRING INDICATING
OU2-ONCT SYSTEM
EFFECTIVENESS



**PLUME BIFURCATION IS
OCCURRING INDICATING
OU2-ONCT SYSTEM
EFFECTIVENESS**

TVOC Trends in GM-21D2/nearby wells

Concentrations of TVOCs in Select Wells vs Time



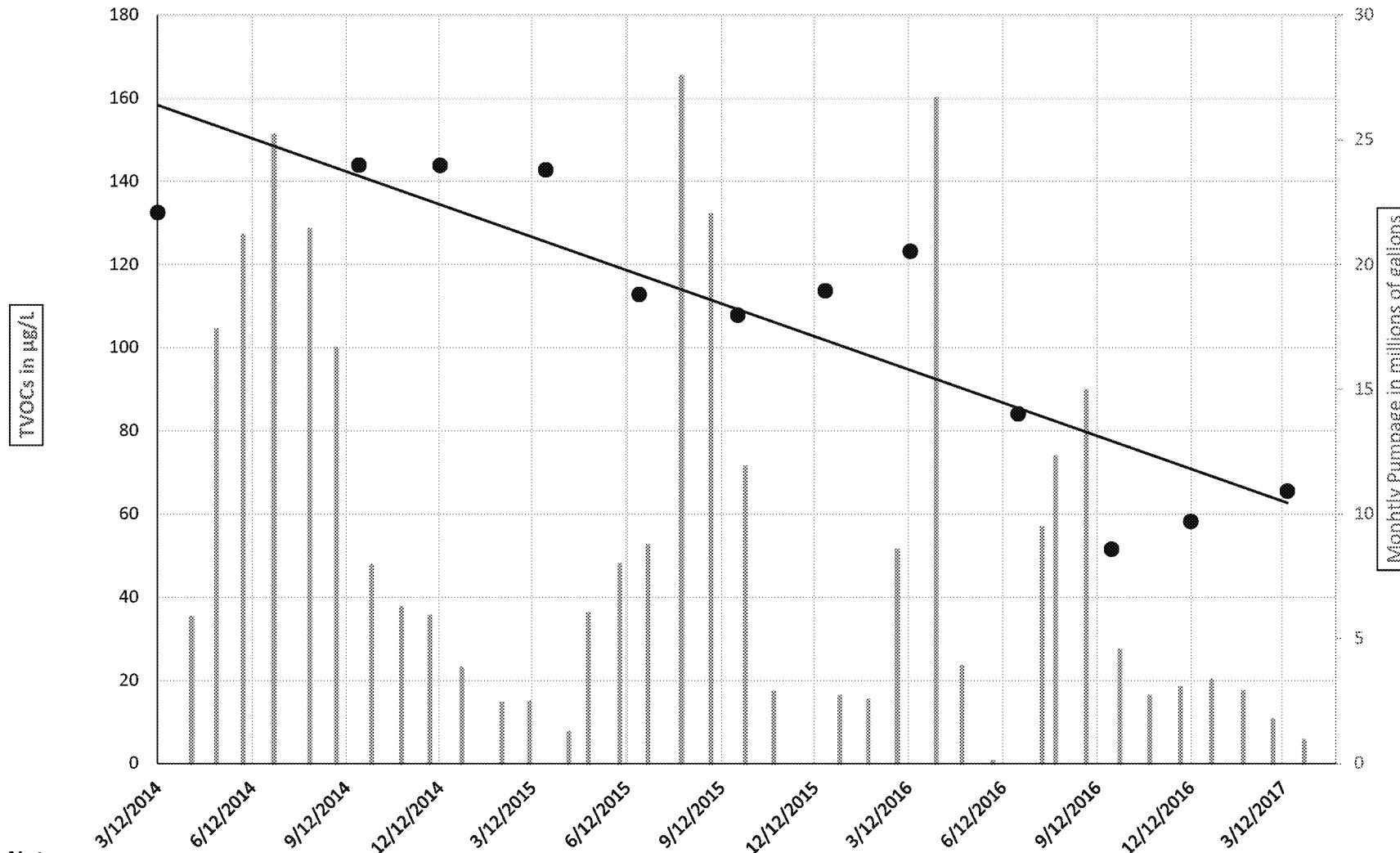
TVOCs in GM-21D2 continuing to decrease since February 2016

Since October 2016, TVOCs in GM-21D2 beginning to stabilize at 2013 levels

Water Quality Changes in GM-21D2 inconsistent with nearby wells and are localized

GM-21D2 within OU2 ONCT capture zone

RE108D1 TVOCs and N-8941 (BWD Well 6-2) Monthly Pumpage vs Time



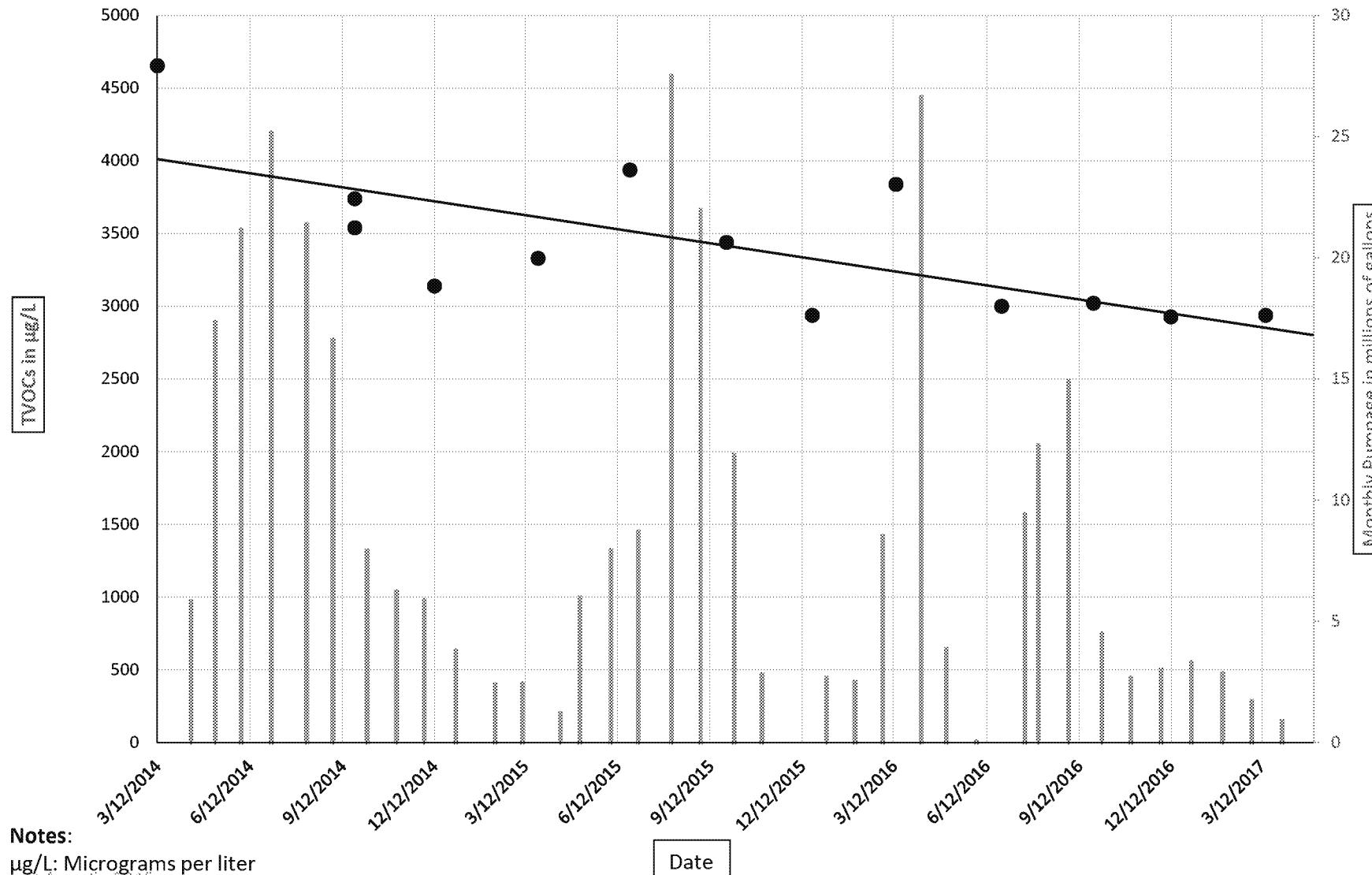
Notes:

µg/L: Micrograms per liter

© Arcadis 2015

Declining trend of
TVOCs at RE-108D1
well location

RE108D2 TVOCs and N-8941 (BWD Well 6-2) Monthly Pumpage vs Time

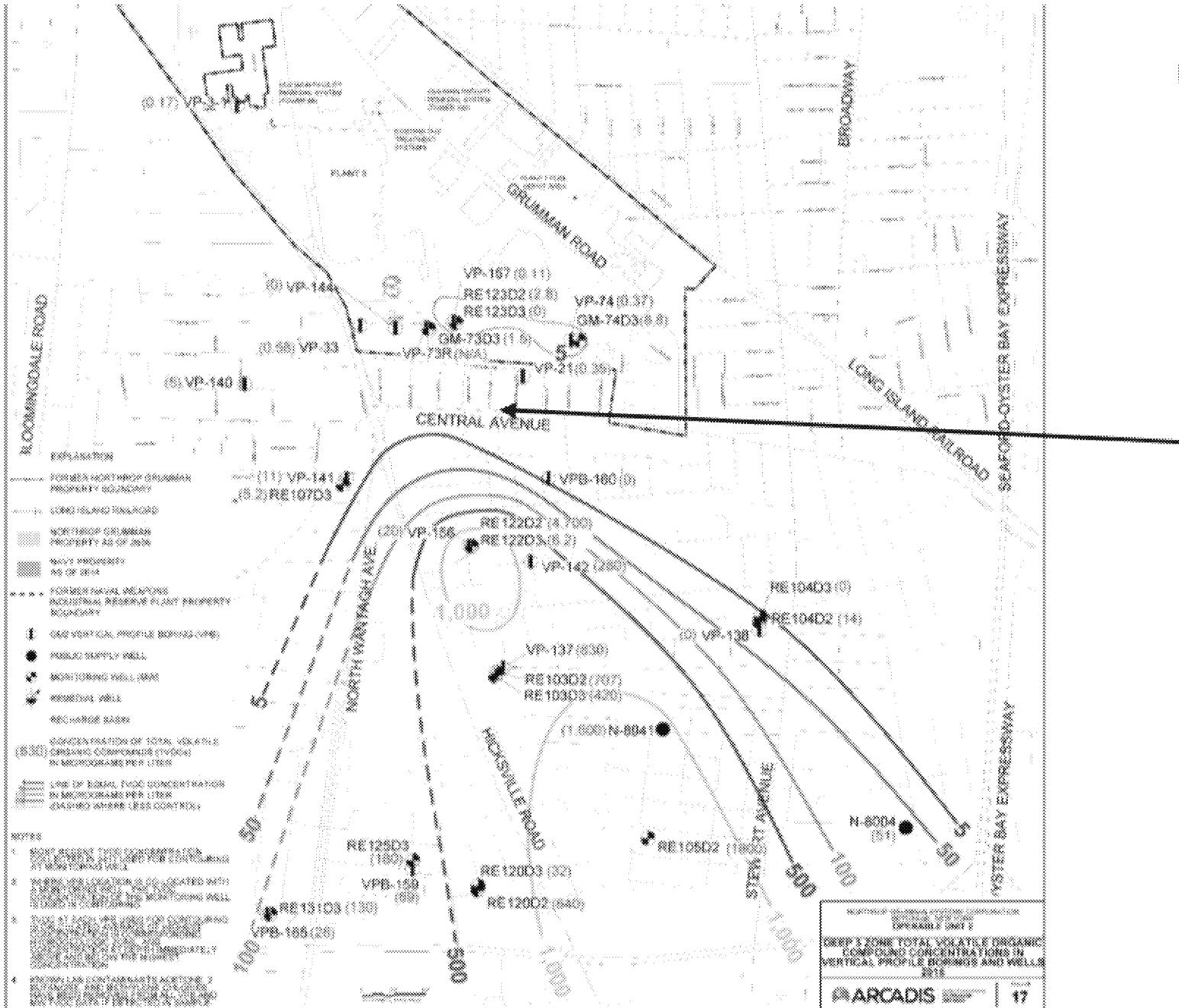


Declining trend of
TVOCS at RE-108D2
well location

Notes:

µg/L: Micrograms per liter

© Arcadis 2015



PLUME BIFURCATION IS OCCURRING INDICATING OU2-ONCT SYSTEM EFFECTIVENESS

Groundwater Monitoring

- Summary of 1,4-dioxane results for 2Q-2017 by Hydrogeologic Zone (73 wells sampled)

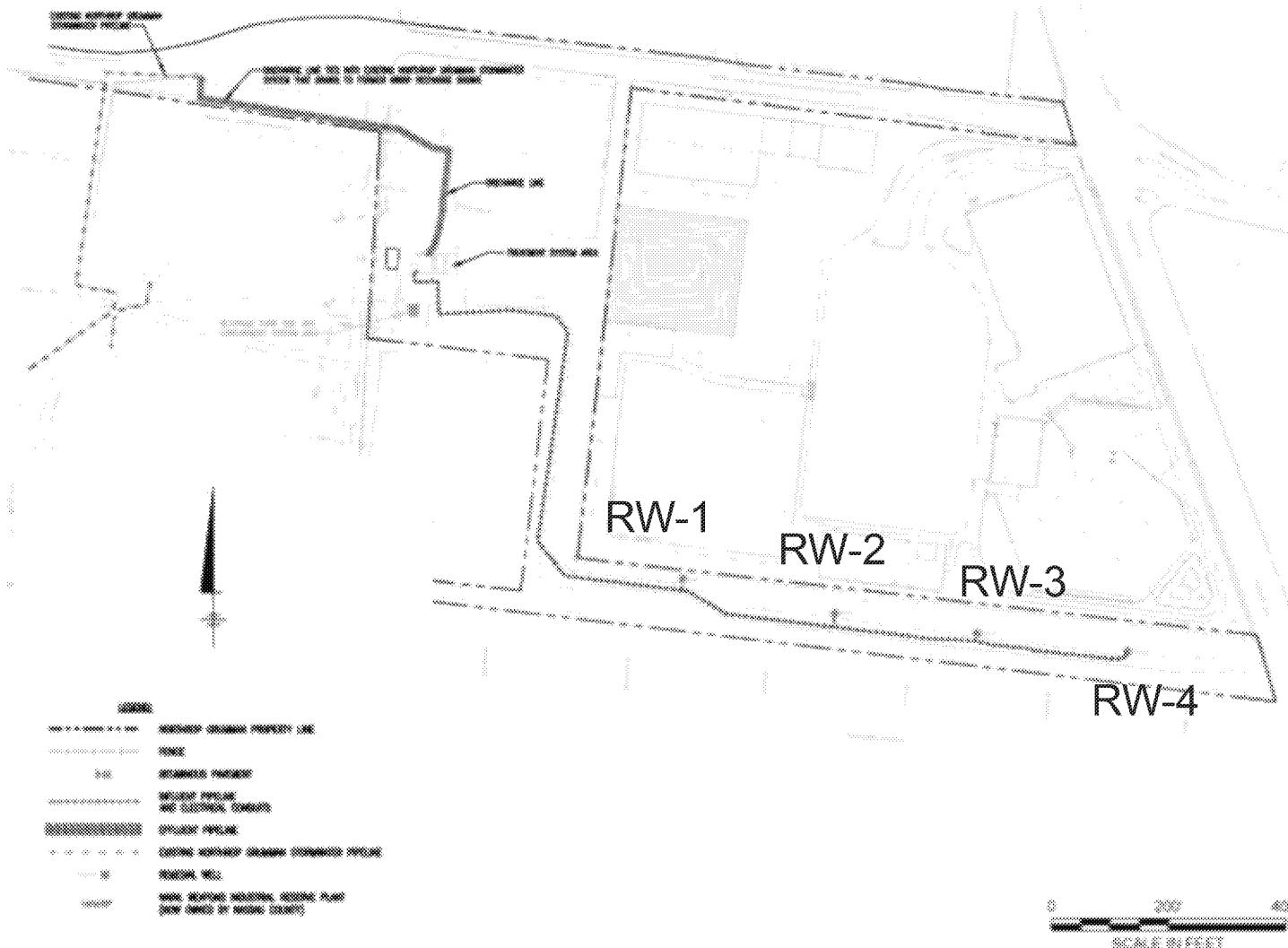
Shallow	ND - 13.7
Intermediate	0.69-6.73
Deep	0.1-15.2
Deep 2	ND - 24.2
Deep 3	ND - 4.34

OUR ACTIVITIES

Update on Northrop Grumman OU3-ONCT Activities

- OU3-ONCT System OM&M
- OU3-ONCT System Effectiveness
- Off-Site RW-21 Project Area
- Hydraulic Effectiveness Study

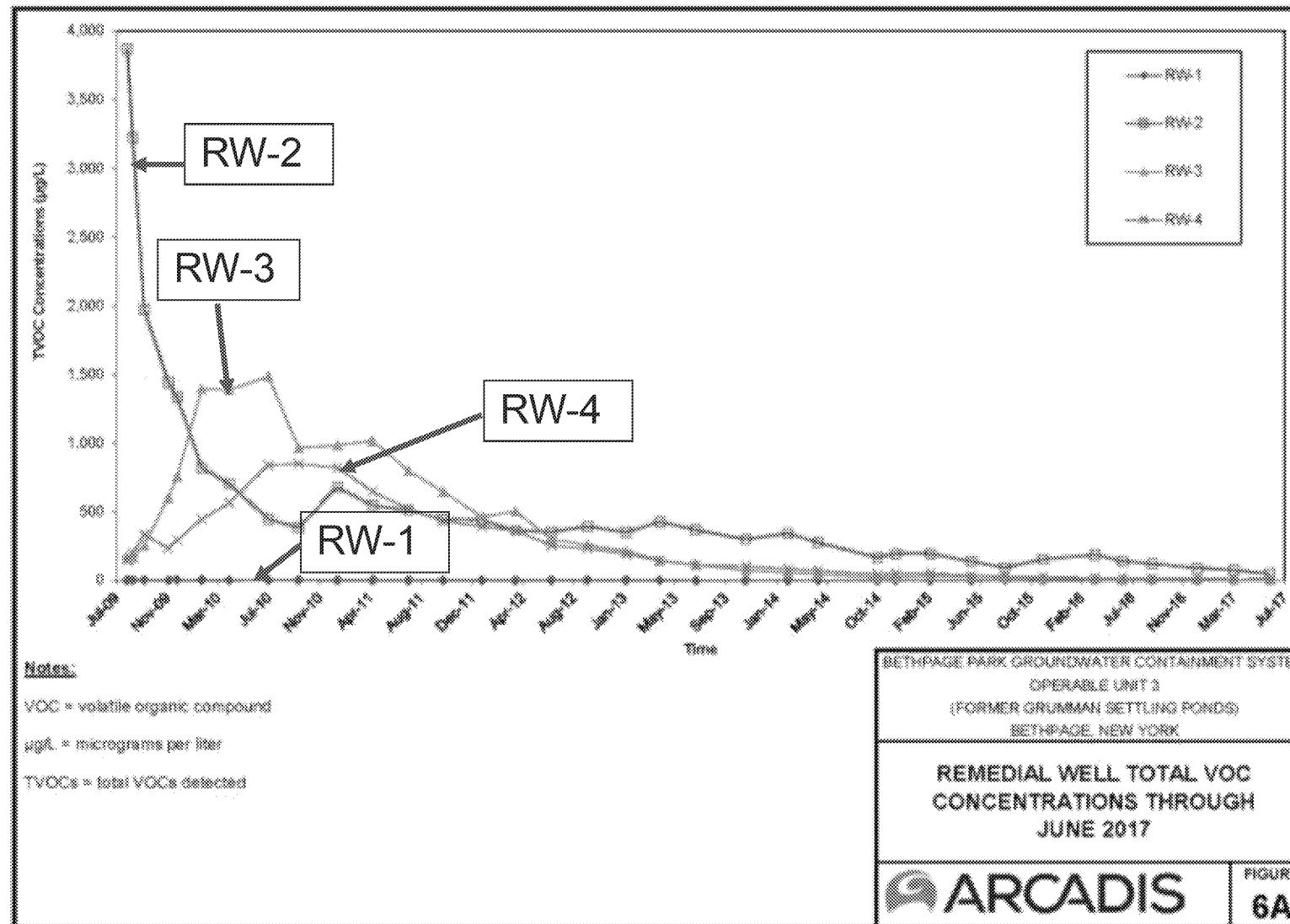
OU-3 ONCT OM&M



- Uptime & Performance (2Q 2017)
 - 98.8% uptime
 - >99% treatment efficiency

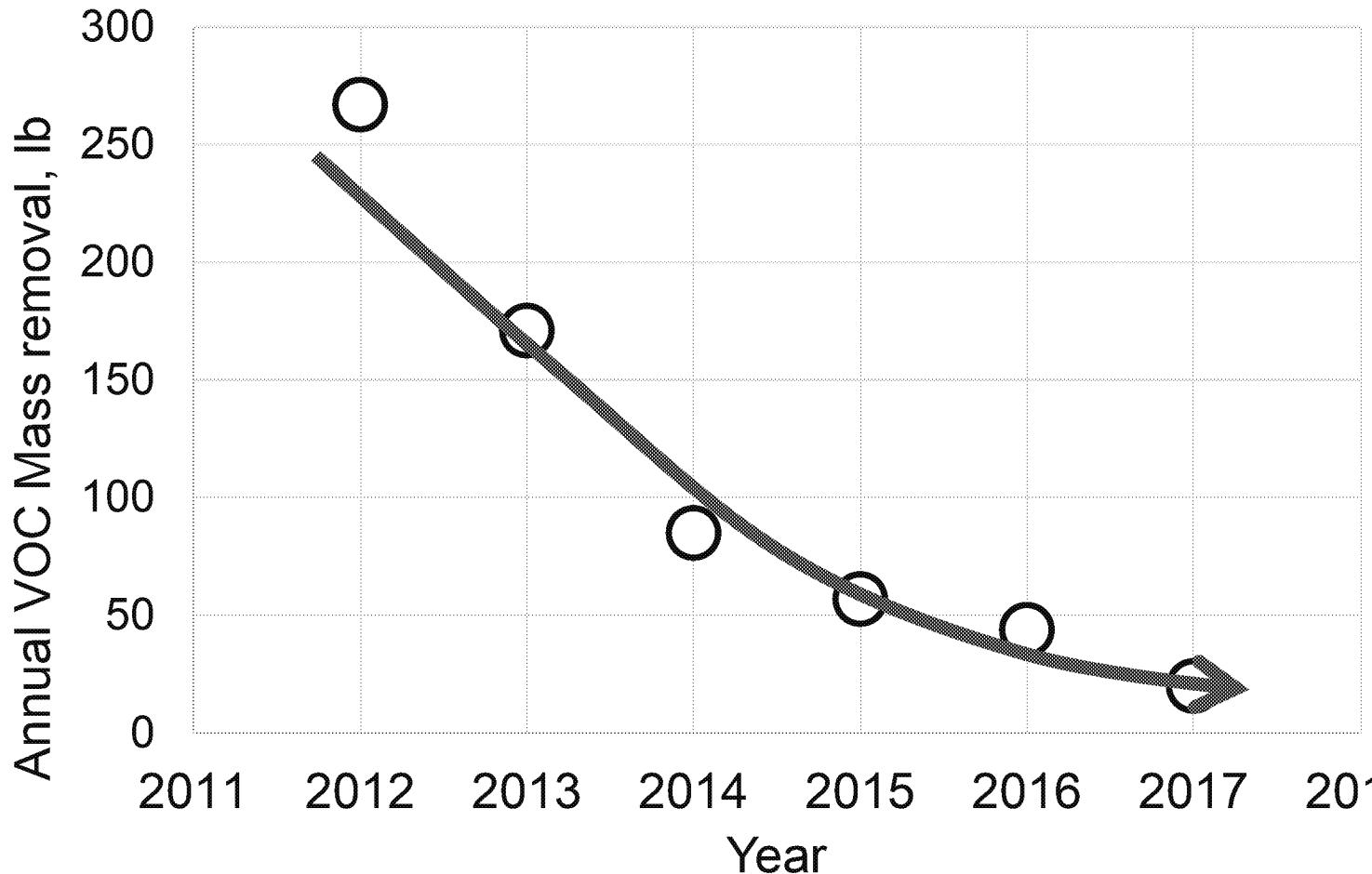
- Cumulative Mass Removal
 - 2,165 lbs VOCs removed from start up of System in 3Q 2009 through 2Q 2017

TVOC Trends OU3 ONCT Remedial Wells



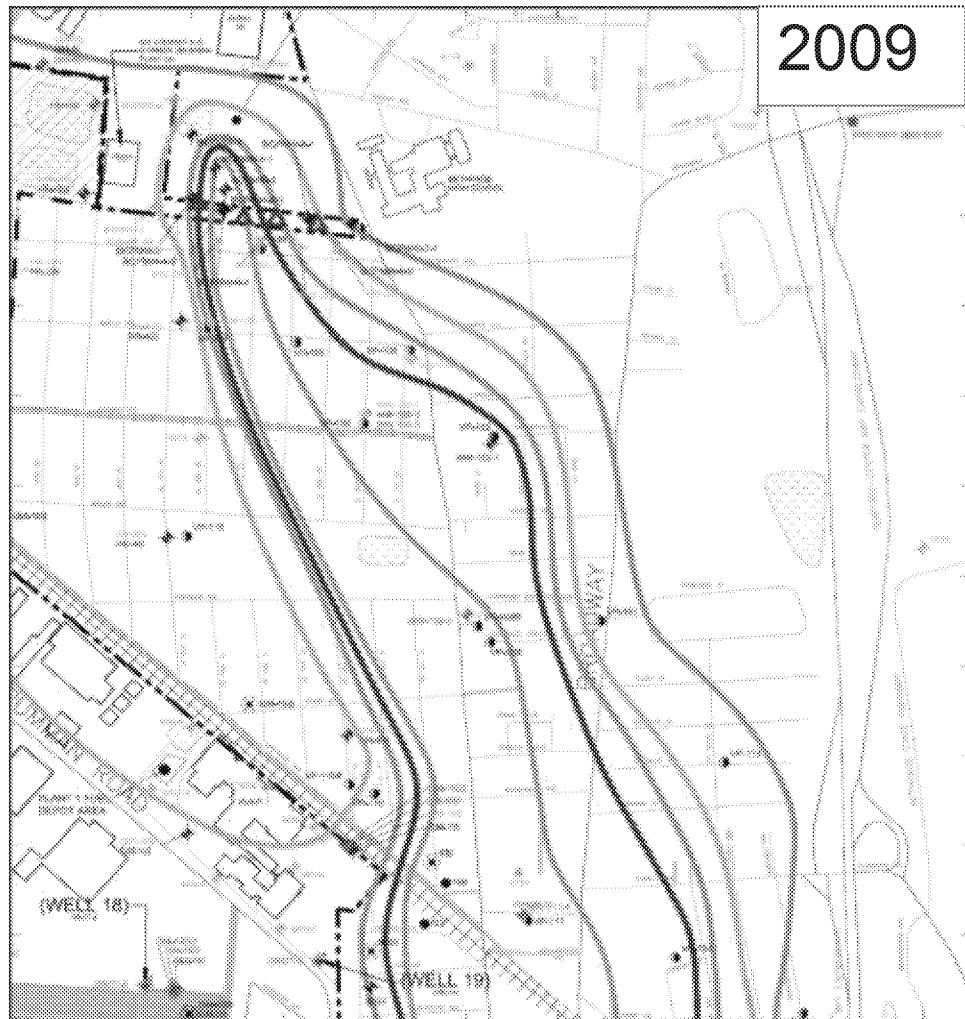
- RW-1
 - VOCs ND in influent
- RW-2
 - >98% reduction from historical maximum
- RW-3
 - No VOCs above MCLs
- RW-4
 - No VOCs above MCLs

VOC Mass Removal OU3 ONCT Remedial Wells



- Steady decreases in VOC mass recovery reflect improving groundwater quality at Park
- Concentrations beneath the Park have declined 99% from historical levels
- Peak groundwater concentrations have declined from greater than 300,000 ppb to less than 1,000 ppb
- Wells are less than 1,000 ppb since 2013

Plume Near Park



2009



2017

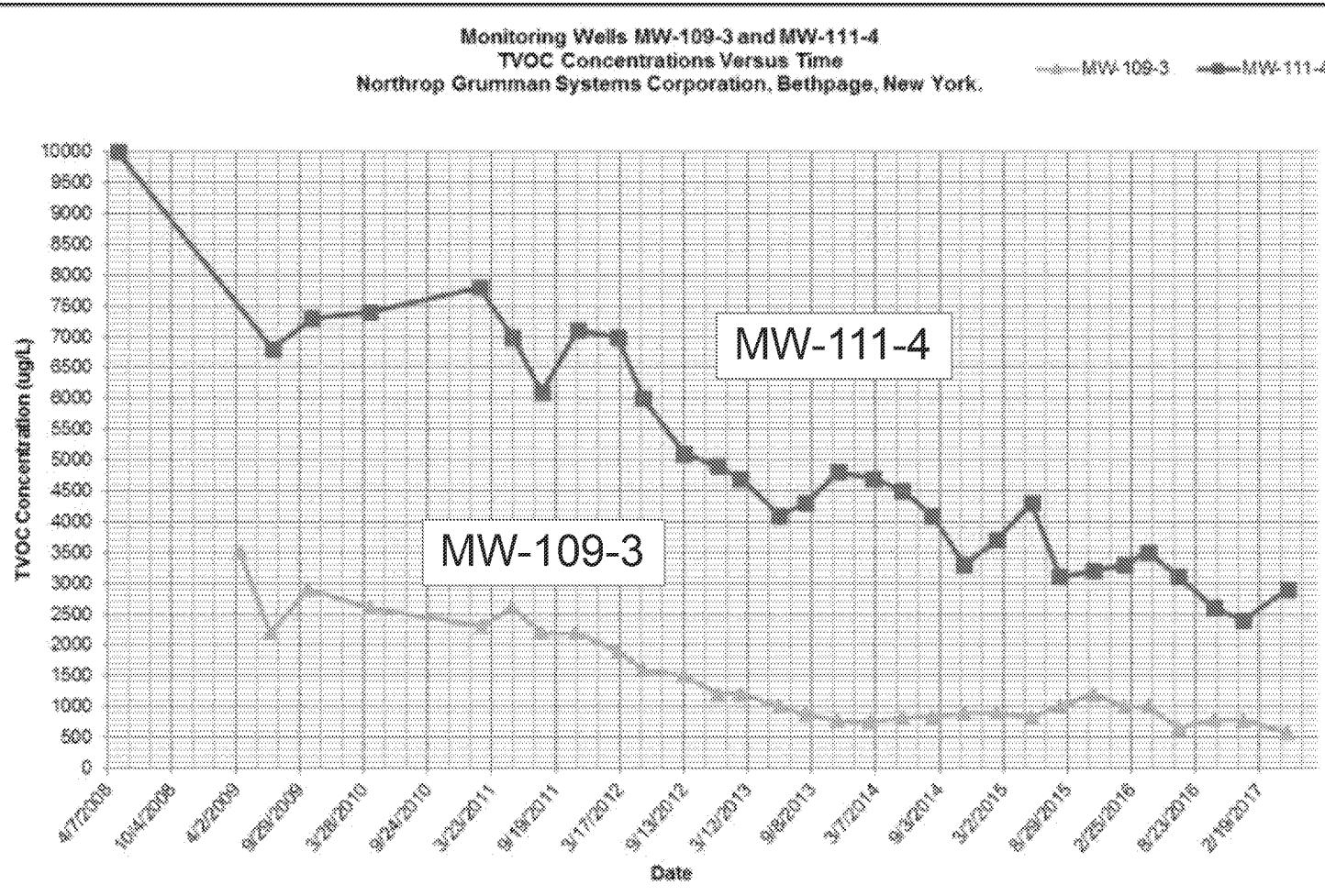
5000 ppb contour is now north of LIRR tracks;
1000 ppb contour is now 3,600 feet south of it's 2009 location.

© Arcadis 2016

- Groundwater concentrations beneath the Park have declined 99% from historical levels
- Plume has separated from Park since mass flux was stopped
- Significant improvements in downgradient groundwater quality

—	5 ppb
—	50 ppb
—	500 ppb
—	1,000 ppb
—	5,000 ppb

TVOC Trends Downgradient of Park



- MW-109-3
 - 83% reduction since 2009
- MW-111-4
 - 71% reduction since 2008
- Shows effect of Park groundwater system in improving groundwater quality downgradient of Park

RW-21 Project Area Overview

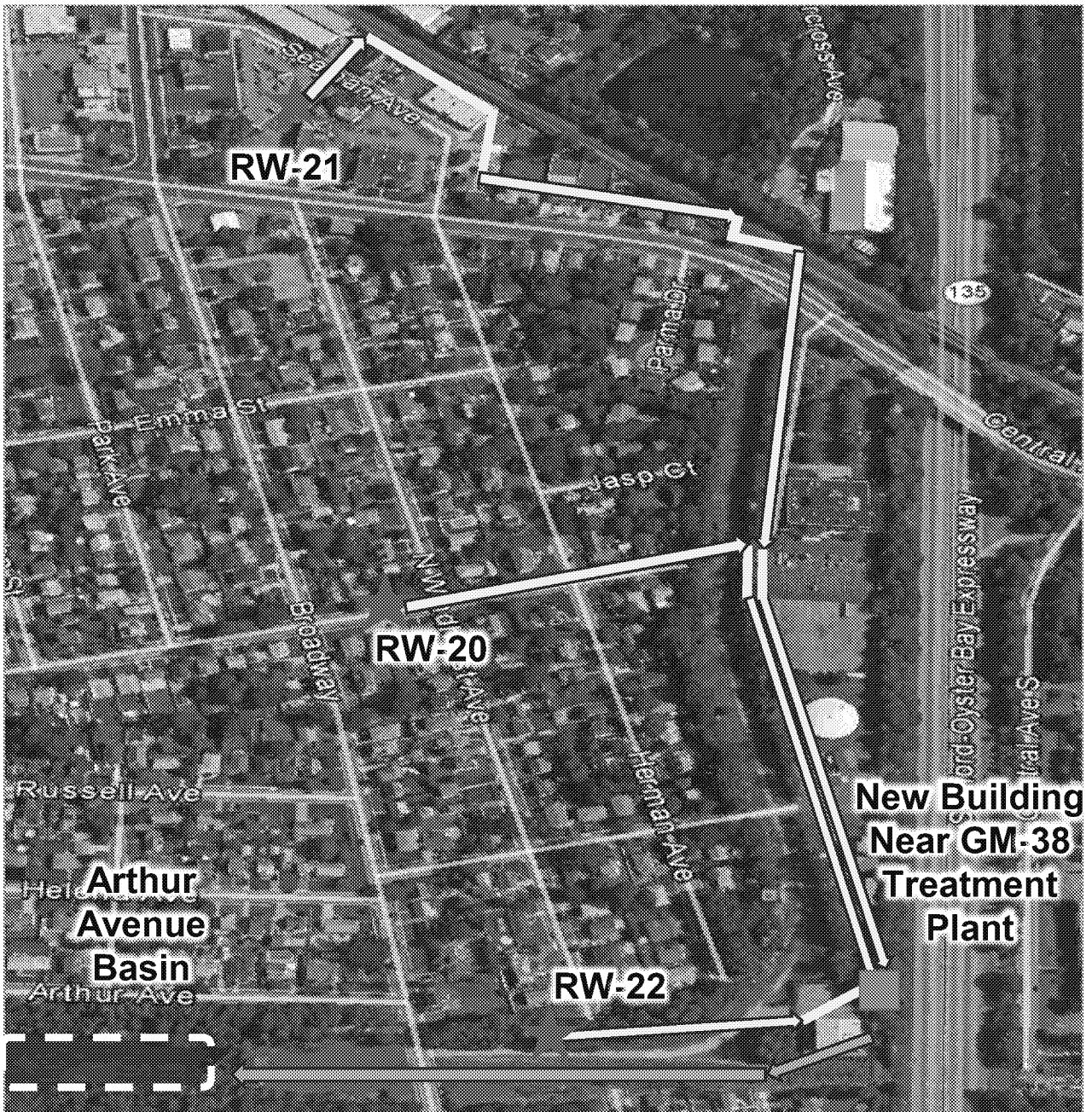
★ NYSDEC- approved, TOB permitted well

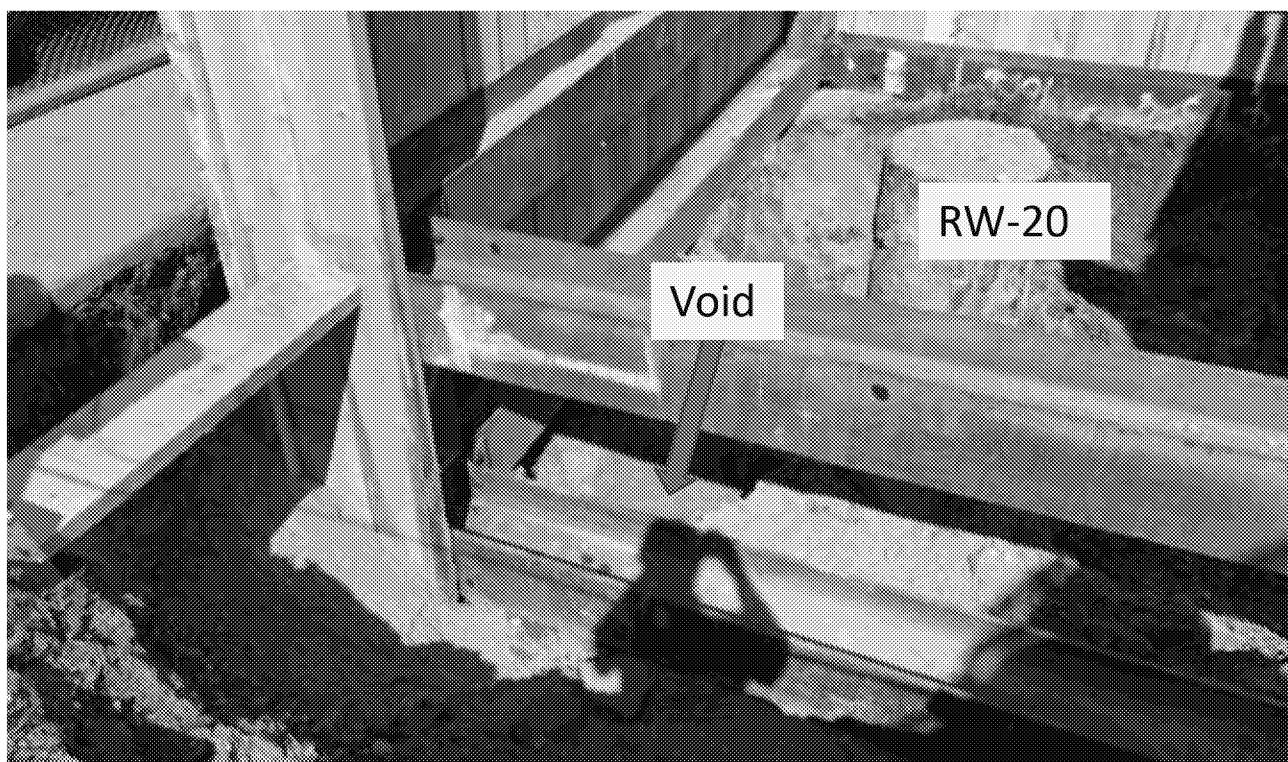
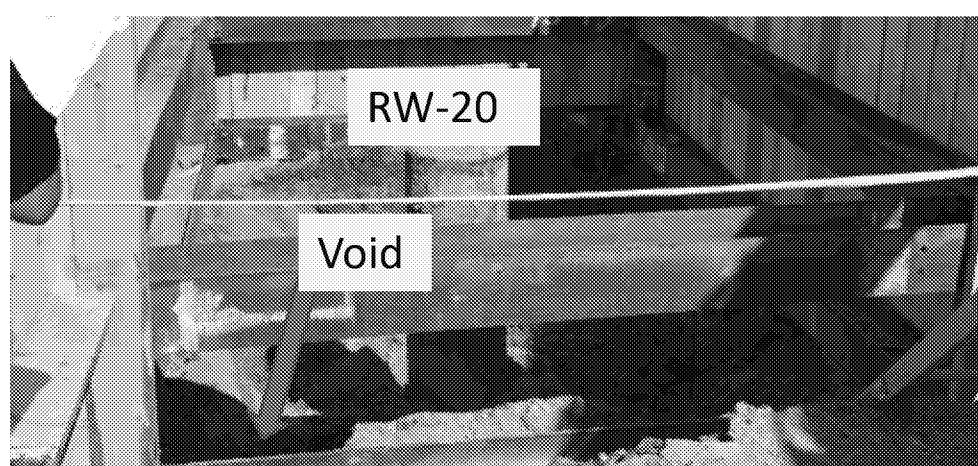
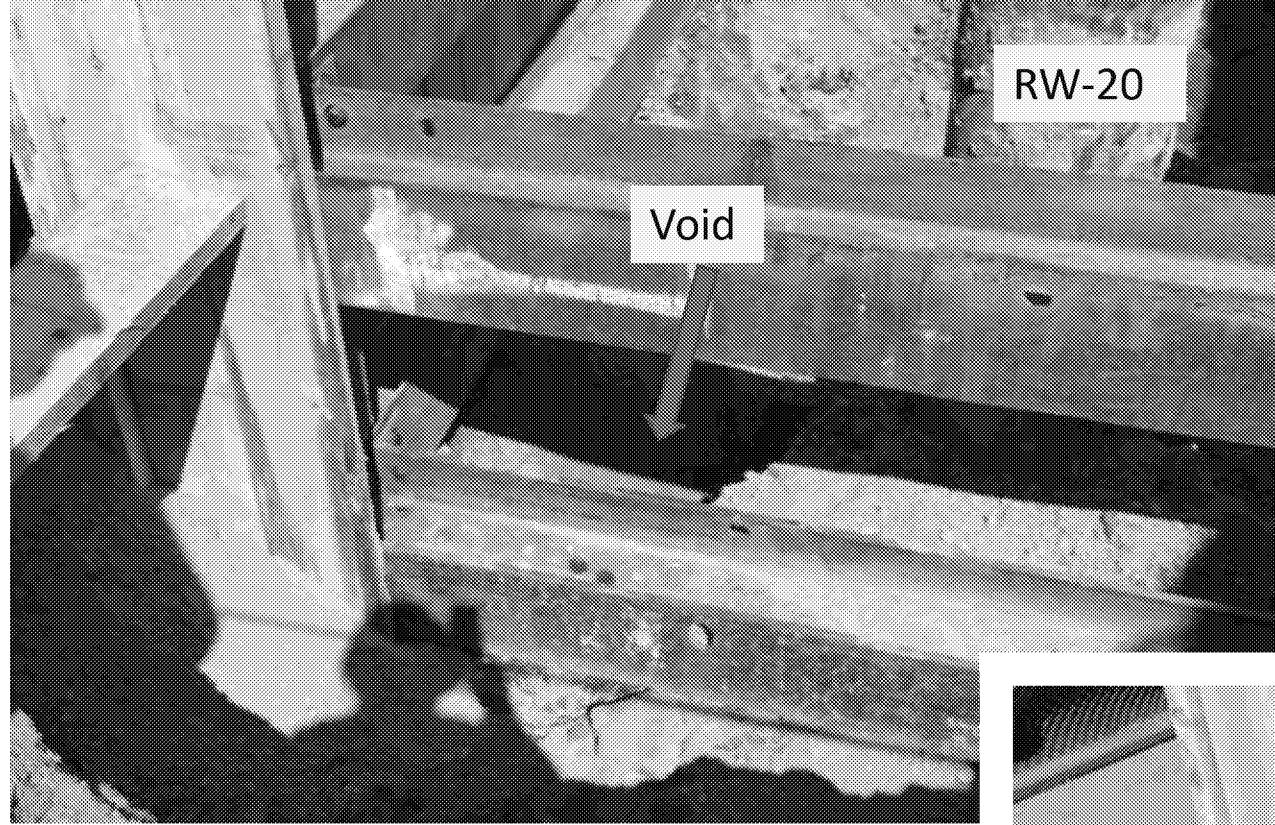
■ Proposed treatment building

↔ Proposed buried water line and flow direction

↔ Existing Navy GM-38 buried treated water line and flow direction

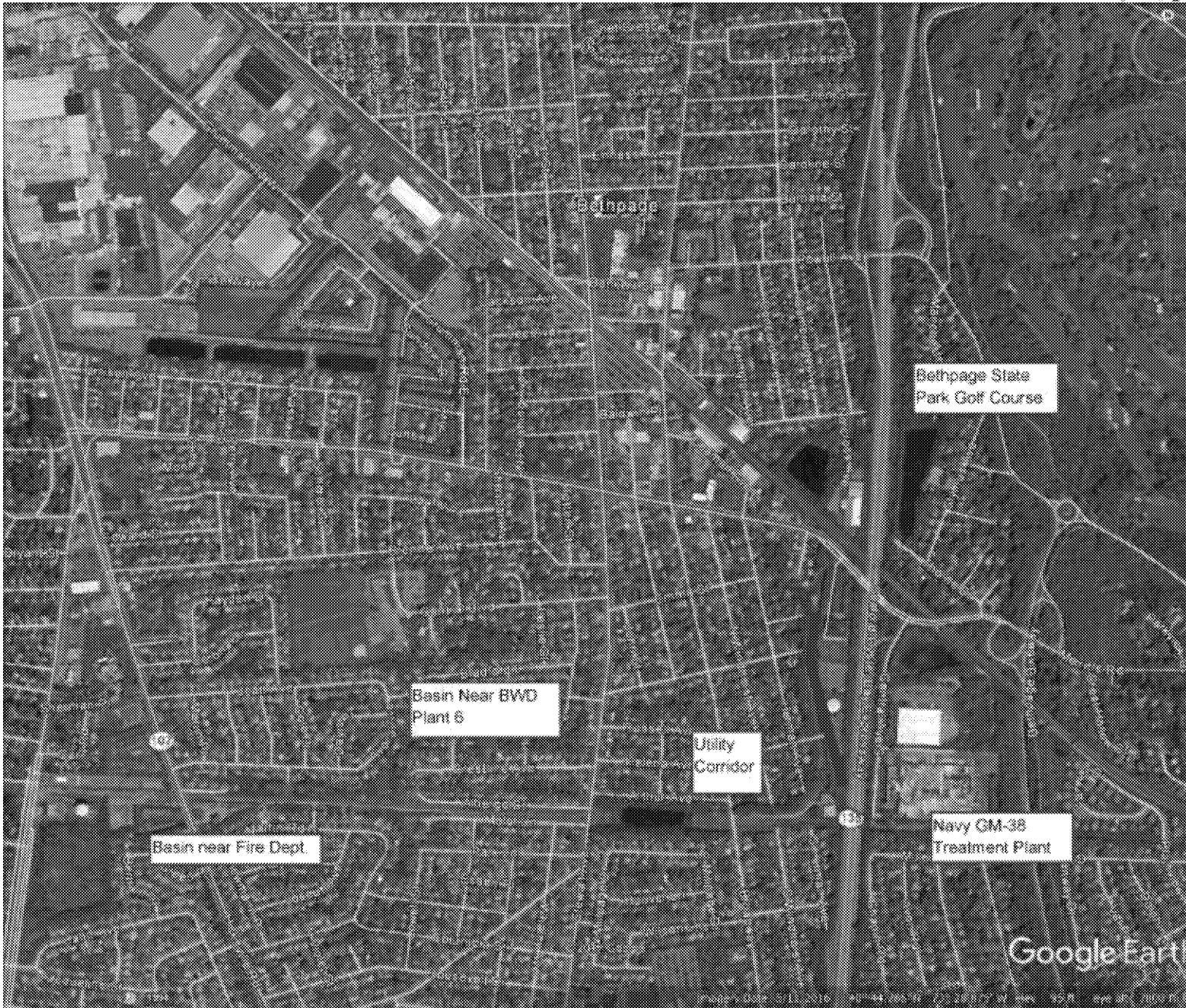
Other discharge options are being evaluated





RW-21 Area Potential Discharge Options

- NYSDOT Basin south of Levittown Fire Department
- NCDPW Basin northwest of BWD Plant 6
- Bethpage State Park Golf Course – new basin
- Portion of utility corridor running north from the proposed treatment plant - shallow wells



Additional OU3 Activities (RW-21 Area Groundwater)

- Continue to communicate with residents and Town of Oyster Bay regarding upcoming work
- VPBs 13, 14, 15 and 16 drilled and sampled
- MW 13, 14, 15 and 16 installed, developed and sampled
- Remedial Wells RW-20, RW-21 and RW-22 installed and developed

Additional OU3 Activities

- Hydraulic Effectiveness Study
 - Inspected two offsite wells, plan to abandon and replace
 - Install Monitoring Wells as Phase I
 - Drill additional Vertical Profile Borings contingent on monitoring well results
 - Contractor selected, work being scheduled

RADIUM WATER SAMPLING

Radium Water Sampling

- As requested by NYSDEC
 - Sampled OU2 and OU3 ONCT system effluents (mid August 2017)
 - Sampled RW-21 Project Area Recovery Wells RW-20, RW-21, and RW-22 (late August 2017)
 - Sampled RW-21 Project Area Monitoring Wells MW-1, MW-9 and MW-14 (late August 2017)
 - Results expected 6 weeks after sampling



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Update on Engineering Investigation and Feasibility Study (FS)

U.S. Navy and Northrop Grumman Bethpage Facility Sites

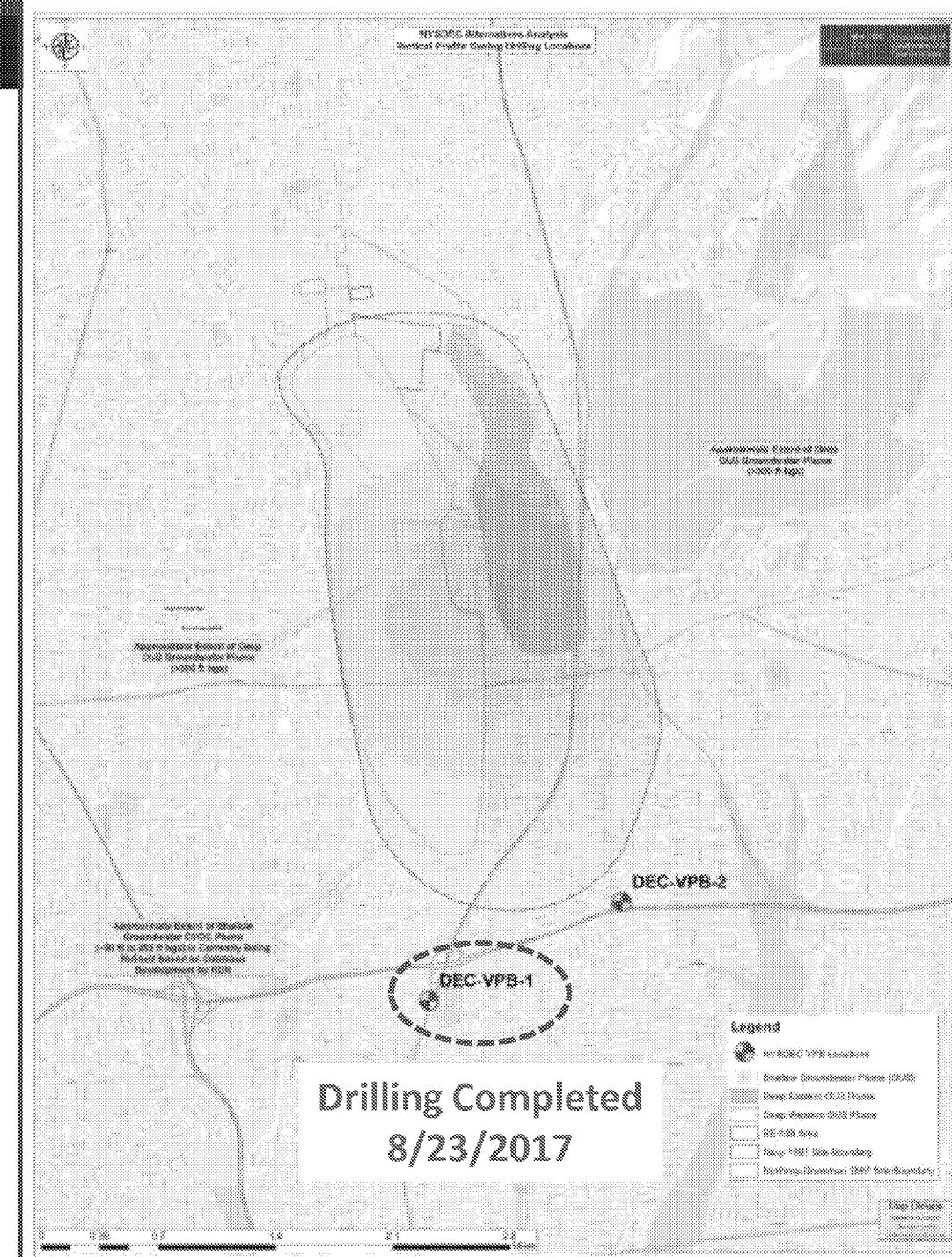
September 11, 2017

THREE MAJOR COMPONENTS:

- 1) Drilling Program
- 2) Groundwater Modeling
- 3) Feasibility Study/Detailed Engineering Analysis

1) DRILLING PROGRAM

- Two Locations – Southern Area
- Areas with Data Gaps
- Drilling Completed at DEC-VPB-1
- Drilling to Raritan Clay
- Downhole Geophysics by USGS
- Grab Groundwater Sampling
- Completed as Monitoring Wells



DEC-VPB-1



ED_002631_00003215-00054

DEC-VPB-2

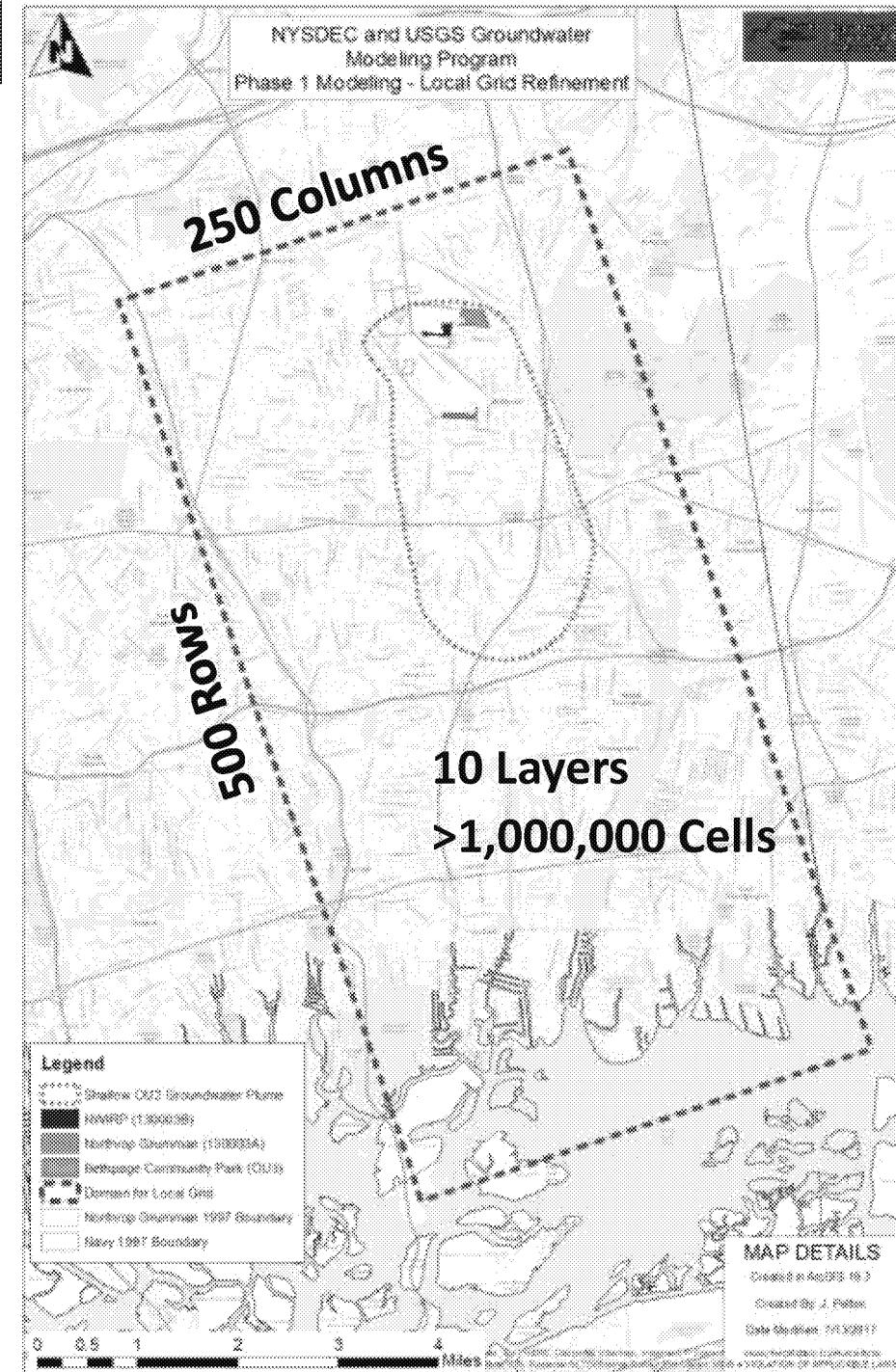


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community

ED_002631_00003215-00055

2) MODELING PROGRAM

- Partnership with USGS
- 2 Major Components:
 1. Groundwater Database Development – Plume Shells
 2. Groundwater Flow Modeling
 - Phase 1 Modeling (underway)
 - Phase 2 Modeling



Groundwater Quality Database Development

Data assembled from:

1. NYSDEC EIMs

2. U.S. Navy

3. Northrop Grumman

4. Nassau County

Database Statistics

Total Number of Records: 180,242

Number of Wells: 320

Number of Borings: 152

Number of Groundwater Samples: 4,235

Positive TCE Results: 1,981

Date Range: June 2000 to June 2017

3-D Plume Representations

NWIRP &
NGC Sites

Bethpage
Community Park

TCE 5 ppb Plume Shell

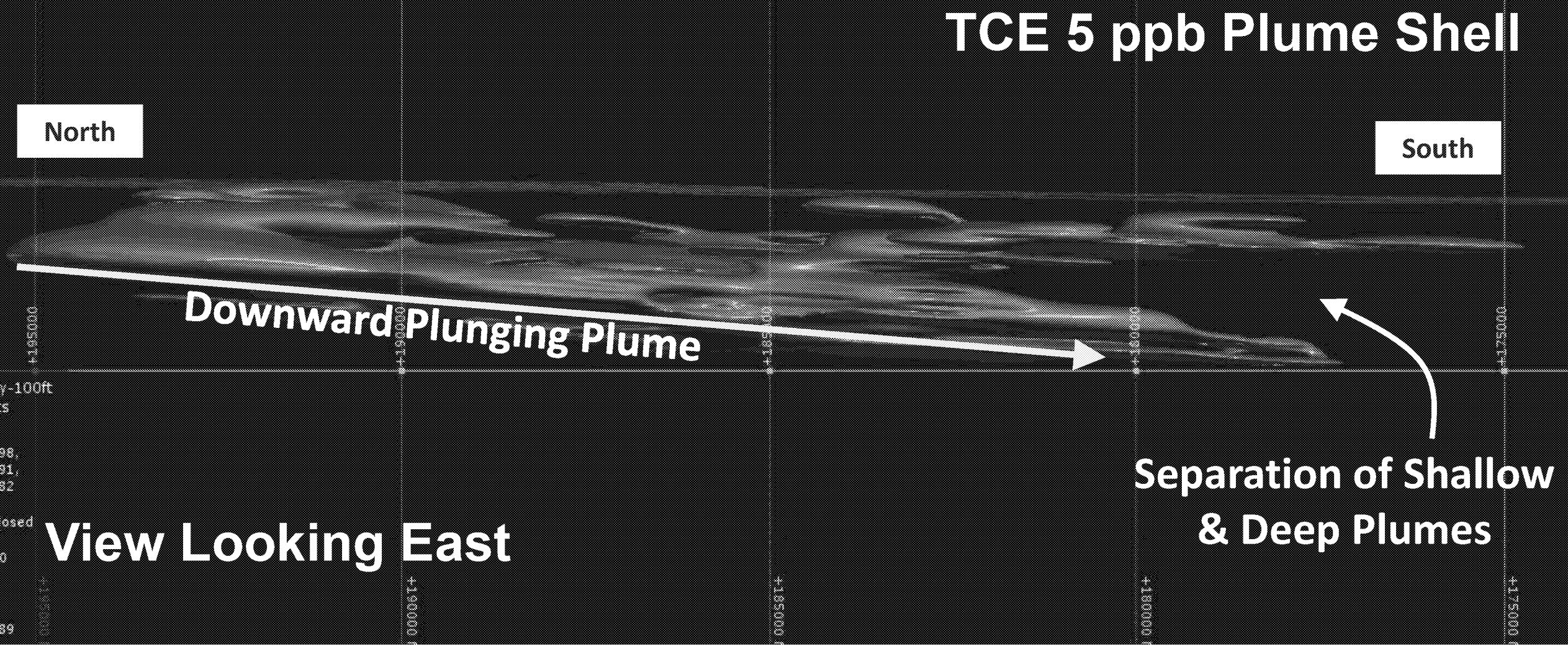
2) Thinning to North

1) Irregular Surface

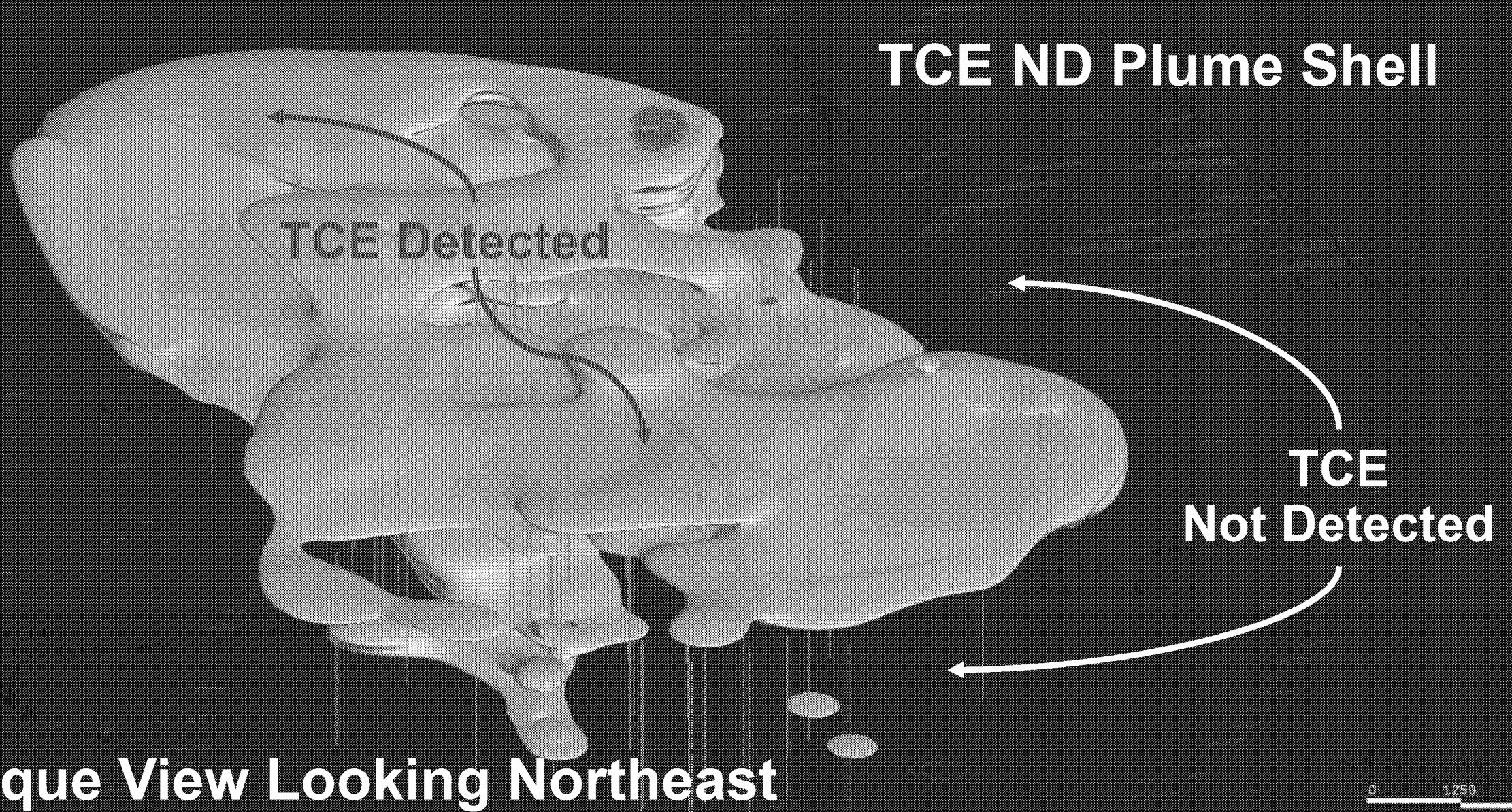
3) Shallow & Deep Plumes

Oblique View Looking Northeast

3-D Plume Representations



3-D Plume Representations



3-D Plume Representations

TCE ND Plume Shell

View Looking East

Update on Scenarios Being Provided to USGS for Phase I Modeling

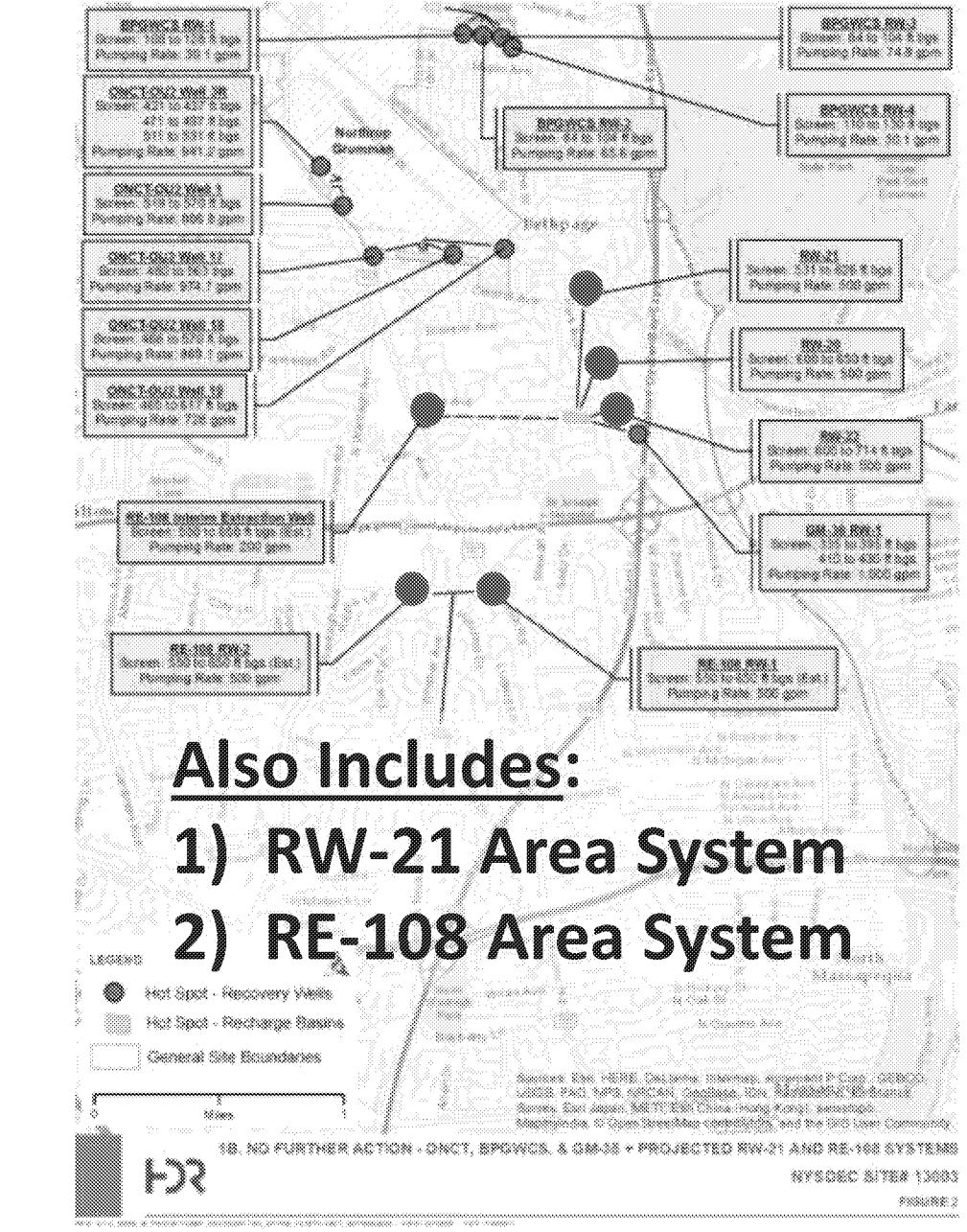
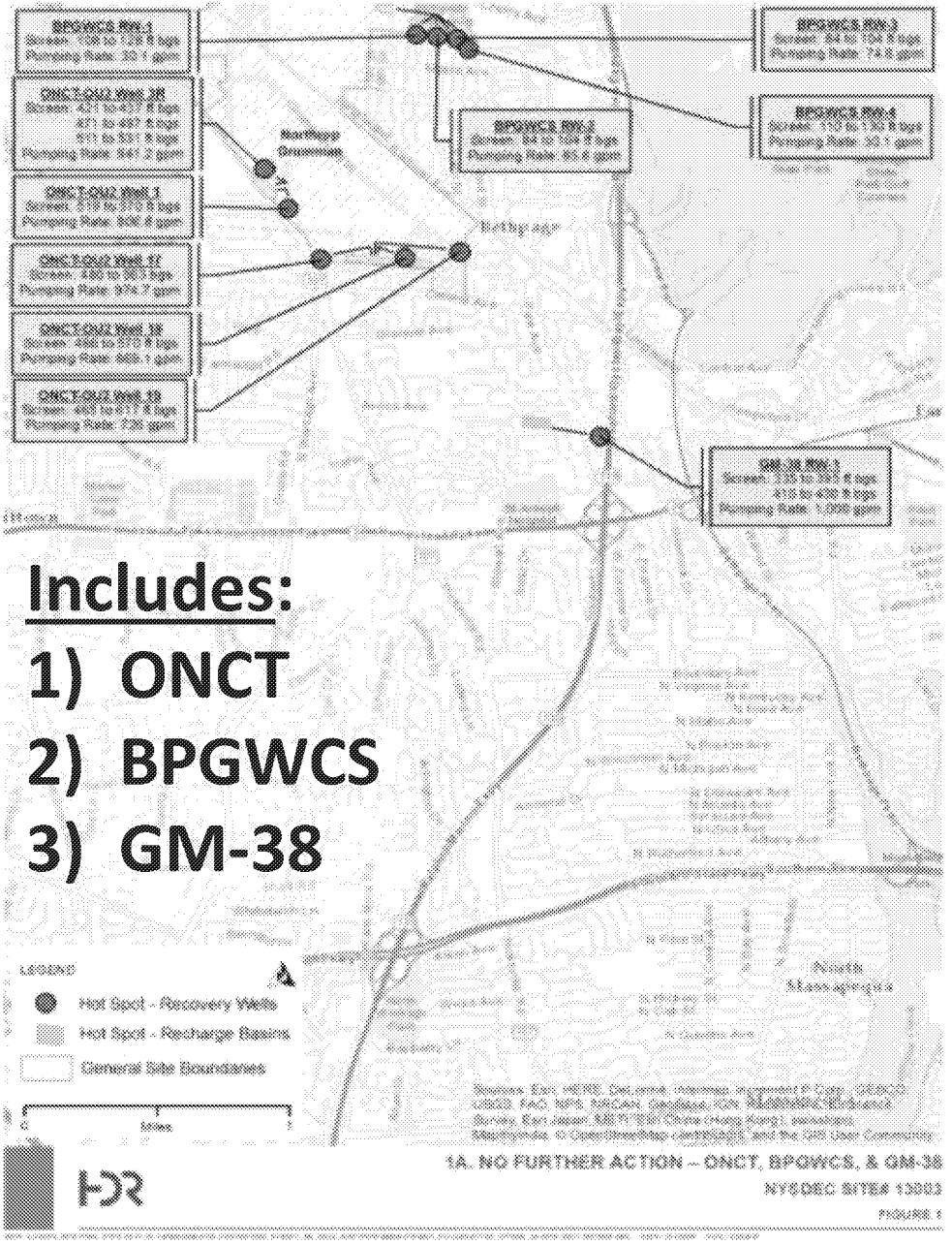
No Further
Action



Full Containment

Remedial Option Scenarios 1A & 1B (No Further Action Scenarios)

13

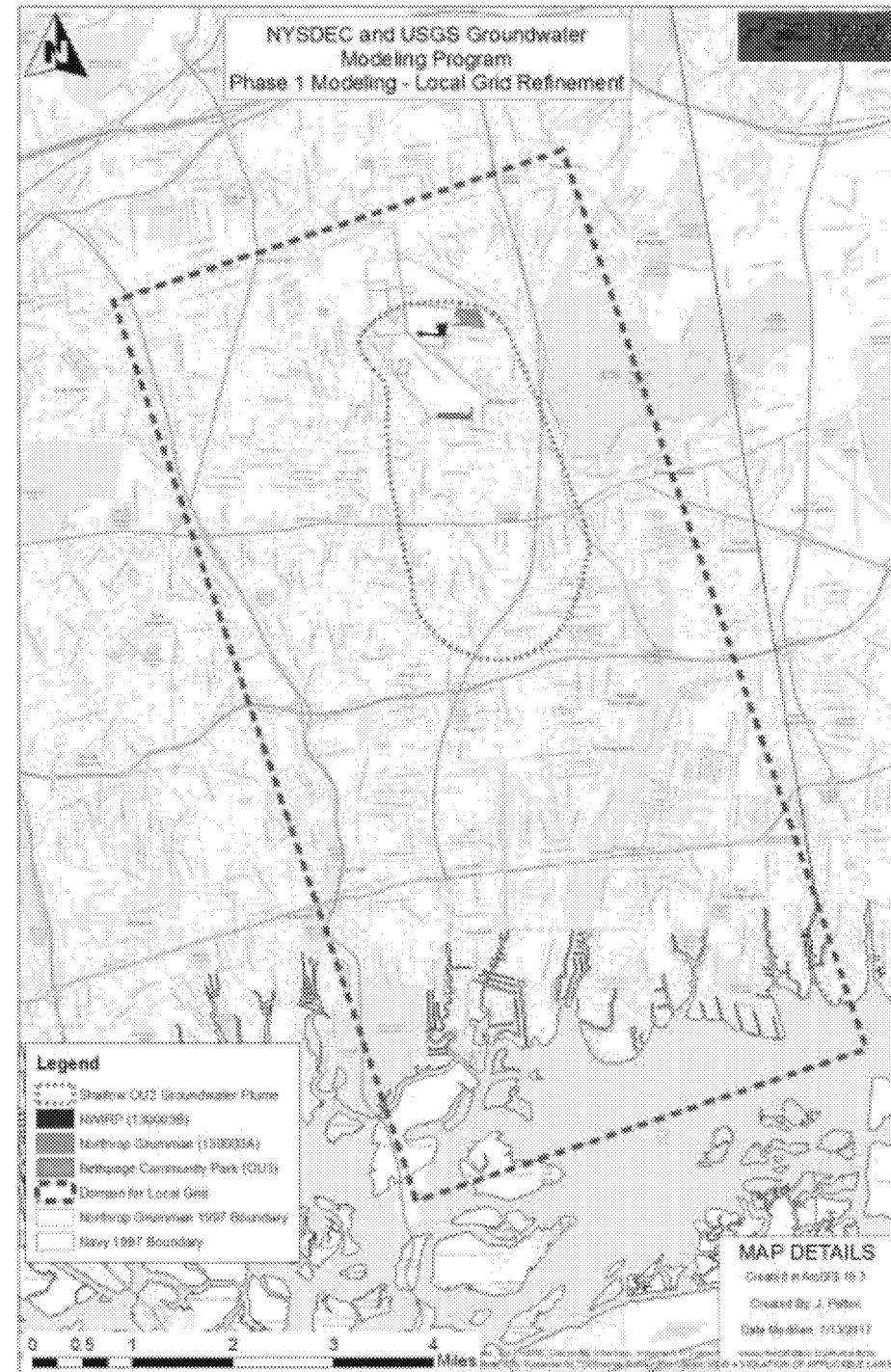


Remaining Anticipated Scenarios

1. Hydraulic Containment COCs to SCGs
2. Hydraulic Containment to ND (Full Plume Containment)
3. Plume Mass Remediation
4. Aquifer Flushing with Injection Wells

3) FS / ALTERNATIVES ANALYSIS

- Report Currently Being Written
- Draft Technical Memorandums Being Prepared (FS Sections)
 1. RAOs and COCs Memo
 2. Technology Screening Memo
- Met with NCDPW, DOW, F&W, USGS



Site Related Contaminants of Concern and Chemical Specific SCGs

Contaminant of Concern	CAS #	OU2 ROD	OU3 ROD	PWSCP	GW Plume FS	NYSDEC Part 703.5 Class GA ($\mu\text{g/l}$)	NYSDEC TOGS 1.1.1 ($\mu\text{g/l}$)	NYSDOH Part 5, Subpart 5-1 ($\mu\text{g/l}$)	Federal MCLs ($\mu\text{g/l}$)	Federal MCLG ($\mu\text{g/l}$)	Lowest SCG ($\mu\text{g/l}$)
1,1,2,2-Tetrachloroethane	79-34-5			X	X	5	5	5	NS	NG	5
1,1,1-Trichloroethane	71-55-6	X	X	X	X	5	5	5	200	200	5
1,1,2-Trichloroethane	79-00-5		X	X	X	1	1	5	5	3	1
1,1-Dichloroethane	75-34-3	X	X	X	X	5	5	5	NS	NG	5
1,1-Dichloroethene	75-35-4	X	X	X	X	5	5	5	7	7	5
1,2-Dichloroethane	107-06-2	X	X	X	X	0.6	0.6	5	5	0	0.6
1,2-Dichloropropane	78-87-5		X		X	1	1	5	5	0	1
Chloroform	67-66-3		X	X	X	7	7	NS	NS	70	7
cis-1,2-Dichloroethene	156-59-2		X	X	X	5	5	5	70	70	5
Dichlorofluoromethane	75-43-4		X		X	5	5	NS	NS	NG	5
Dichlorodifluoromethane	75-71-8		X		X	5	5	5	NS	NG	5
Tetrachloroethylene	127-18-4	X	X	X	X	5	5	5	NS	0	5
Toluene	108-88-3		X		X	5	5	5	1000	1000	5
trans-1,2-Dichloroethene	156-60-5		X	X	X	5	5	5	70	100	5
Trichloroethylene	79-01-6	X	X	X	X	5	5	5	5	0	5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		X	X	X	5	5	NS	NS	NG	5
Vinyl chloride	75-01-4	X	X		X	2	2	2	2	0	2
Carbon disulfide	75-15-0			X	X	60	NS	NS	NS	NG	60
Carbon tetrachloride	56-23-5			X	X	5	5	5	5	0	5
Chlorobenzene	108-90-7			X	X	5	5	5	100	100	5
1-4 Dioxane	123-91-1				X	NS	NS	50 (see notes)	NS	NG	0.67 (see notes)
Chromium	7440-47-3		X		X	5	50	100	100	100	5
Iron	7439-89-6		X		X	300	300	300	NS	NG	300
Nickel	7440-02-0		X		X	100	100	state MCL	NS	NG	100

Notes:

NS- No designated standard

NG- No designated goal

NYSDOH Part 5, Subpart 5-1 designates a maximum concentration of 50 $\mu\text{g/l}$ for 1-4 Dioxane as a unspecified organic compound

Criteria based on a 10-6 lifetime excess cancer risk screening level in tap water, (EPA, 2013C)



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KEY EVALUATIONS INCLUDED IN FS

- 1) Capture of Plume/s
- 2) Landward Migration of Freshwater-Saltwater Interface
- 3) Yield of Nearby Community Water Supplies
- 4) Discharge to Nearby Surface Water Streams & Ultimately South Oyster Bay
- 5) Discharge to Recharge Basins and/or Injection Wells
- 6) Discharge to Local Pollution Control Plants
- 7) Discharge for Beneficial Re-Use

Next Steps

- 1) Continue Phase 1 Modeling
- 2) Late October Public Meeting
- 3) December Public Meeting
- 4) ~Mid-2018 FS/PRAP Public Meeting

